

Indian Science Technology and Engineering facilities Map (I-STEM)

Invites application for

1. **Partial financial support for using R&D facilities in other institutions through the I-STEM web portal to Users from Academic Institutions and Start-ups (Format-1)**

Format for requesting support for accessing and using facilities through the I-STEM web portal.

(i) Details of the Personal Information

- a. Name of the Researcher/Faculty Member
Dr. Jui Vilas Bhandare
- b. Name of the Institution/Start-up
MGV's KBH Dental College and Hospital, Panchavati, Nashik- 422003.
- c. Name of the Department
Department of Periodontology
- d. Degree registered for/Product being developed (for start-up)
Pursuing Post Graduation in Periodontology at MGV's KBH Dental College and Hospital, Nashik.
- e. Mob. No.
+91 8830750033
- f. Email ID:
jbdaree@gmail.com

(ii) Project/Research topic Details:

- a. Project Title/Research Title:
A comparative evaluation of physical properties and antimicrobial efficacy of sutures treated with 5% and 10% Povidone-iodine and Lactobacillus clausii probiotic against periodontal pathogens: An in vitro study.
- b. Sub area:
Periodontics/Dental/Microbiology.
- c. Area Description:
It is a known fact that Povidone Iodine (polyvinylpyrrolidone) (PVP-I) is a hierarchical antiseptic and antiviral agent with powerful microbicidal activities. Thus, PVP-I can be largely used for many different procedures. There are many pretreated sutures coated with various agents available in the market such as sutures coated with chlorhexidine, triclosan, etc. his study allows us to treat our sutures with PVP-I 5%, 10% and

Lactobacillus Clausii Probiotics as it is widely accepted and has many favorable and advantageous assets

d. Aims & Objective (in Bullets):

Aim:

- This study evaluates the improvement in the physical properties of the sutures treated with Povidone-Iodine and Probiotics, as well as the in vitro effectiveness of sutures treated with Povidone-iodine and Probiotics against periodontal pathogens.

Objectives:

- To evaluate tensile strength of uncoated silk sutures, sutures treated 5% and 10% Povidone Iodine and Lactobacillus Clausii Probiotic at baseline before a surgeon's knot.
- To evaluate the tensile strength of uncoated silk sutures, sutures treated 5% and 10% Povidone Iodine and Lactobacillus Clausii Probiotic after tying a surgeon's knot.
- To evaluate the zone of inhibition of uncoated silk sutures, treated 5%, 10% Povidone Iodine and Lactobacillus Clausii Probiotic sutures against Aggregatibacter Actinomyces comitans.
- To evaluate the zone of inhibition of uncoated silk sutures, treated 5%, 10% Povidone Iodine and Lactobacillus Clausii Probiotic sutures against P. gingivalis.
- To evaluate the zone of inhibition of uncoated silk sutures, treated 5%, 10% Povidone Iodine and Lactobacillus Clausii Probiotic sutures against F. nucleatum.

e. Duration (MM/YYYY):

6-8 months.

f. Project Summary (1000 words):

Contact person: Dr. Jui Vilas Bhandare

Phone no: +91 9930750033

Country: India

Purpose: To appraise the physical properties via tensile strength of the baseline and knotted suture and the antimicrobial property via zone of inhibition of the uncoated silk sutures, treated 5%, 10% Povidone Iodine and Lactobacillus Clausii Probiotic sutures

Description: Sutures must have high tensile strength but also lose their strength at the same rate as the tissue gains strength. They should be easy to handle and form secure knots. Knotting of suture induces decrease in their mechanical properties. Povidone Iodine (polyvinylpyrrolidone) PVP-I has a broad antimicrobial spectrum with activity against Gram-positive and Gram-negative bacteria, including antibiotic-resistant and antiseptic-resistant strains, fungi, and protozoa. It is also active against a wide range of enveloped and nonenveloped viruses, as well as some bacterial spores with increased exposure time.

Probiotics are defined as 'live microorganisms that, when administered in adequate amounts, confer a health benefit on the host. In dentistry, probiotics have been employed as useful adjuncts for reduction of caries development, suppressing oral Candida infections, and controlling halitosis. Recent publications have also demonstrated the potential benefit of probiotic administration for management of periodontal diseases.⁶ Probiotics have shown to cause a shift in subgingival microbiota resulting in a less pathogenic environment and also in modulating the immune-inflammatory pathway beneficially.

Rationale:

Suture-site infections occur in nearly 3 percent of all surgical procedures. It has been hypothesized that sutures themselves aid bacteria in infecting suture sites and serve as an infection reservoir. An effective bactericidal suture treatment that reduces suture contamination would be a vital approach to decrease suture-site infections. The main objective is to prevent bacteria from the wound healing site.

g. **Technical Details**

a. TRL

It is proposed that normal sutures soaked pre-operatively in antiseptics could create a zone of inhibition and therefore possibly prevent suture-site infections. Because of risk of infection, the approach of coating sutures with antimicrobial activity has been considered, with the attempt to avoid bacterial colonization of medical materials from the beginning.

b. Methodology

Total sample size = 60.

This study will be carried out on 15 sutures for each group. Physical properties and zones of clearance will be documented.

Group I: sutures treated with 5% PVP-I.

Group II: sutures treated with 10% PVP-I.

Group III: sutures treated with Lactobacillus clausii probiotic. Group IV: uncoated sutures

Groups are further divided into 2 groups depending upon the property/parameter assessed: -

Group A (n =15): 5% Povidone Iodine.

Subgroup 1 Subdivision A (n=5) – Tensile strength before knotting

Subgroup 1 Subdivision B (n=5) – Tensile strength after knotting

Subgroup 2 (n=5) – Microbiological analysis

Group B - (n =15): 10% Povidone Iodine.

Subgroup 1 Subdivision A (n=5) – Tensile strength before knotting

Subgroup 1 Subdivision B (n=5) – Tensile strength after knotting Subgroup 2 (n=5) – Microbiological analysis

Group C - (n =15): Lactobacillus clausii Probiotic.
Subgroup 1 Subdivision A (n=5) – Tensile strength before knotting
Subgroup 1 Subdivision B (n=5) – Tensile strength after knotting
Subgroup 2 (n=5) – Microbiological analysis

Group D - (n =15): Untreated sutures.
Subgroup 1 Subdivision A (n=5) – Tensile strength before knotting
Subgroup 1 Subdivision B (n=5) – Tensile strength after knotting
Subgroup 2 (n=5) – Microbiological analysis

Inclusion criteria: Not Applicable.
Exclusion criteria: Not Applicable.
Subject withdrawal: Not Applicable.

(Division of subgroups - while assessing the physical properties of the specimens, the specimens get broken/destroyed and cannot be used further for microbiological analysis)

c. Design & development

The 3-0 silk sutures aseptically will be cut into small similar-sized pieces of about 4 inches for testing physical properties and approximately 1 inch for microbial assessment.

b. Preparation of sutures coated with 5% and 10% PVP-I.

5% and 10% PVP-I will be purchased and authenticated. These 3-0 silk sutures will be treated by immersing separately in 5% and 10% PVP-I using dip coating method until saturated for 24 hours, to ensure a uniform coating. Later, the sutures will be dried in hot air oven at 190 degrees for 12 minutes. The suture will be evaluated for its physical properties and their antibacterial activity.

c. Preparation of sutures coated with Lactobacillus clausii probiotic. Lactobacillus clausii probiotics oral suspensions vials will be purchased. The sutures will be dipped in the petri dish containing probiotic liquid until saturated. The suture will be immediately freeze-dried at -30 degrees for 20 hours in a freeze drier and then evaluated for its physical properties and antibacterial activity.

d. Control group

A fourth set of sutures were cut into similar-sized lengths without any coating referred to as the control sutures.

d. Facilities and Instrumentation required

1. Hot air oven
2. Freeze dryer/Lyophilizer
3. Vacuum pump
4. Electronic Weighing Machine Universal Testing machine
5. Incubator

e. Consumables (Scientific materials)

1. 3-0 black silk sutures
2. 5% PVP-I
3. 10% PVP-I
4. Lacto Bacillus Clausii Probiotic vial.
5. Aggregatibacter Actinomycesetemcomitans pathogen
6. P. gingivalis pathogen
7. F. nucleatum pathogen
8. Forceps
9. Petri Dish
10. Agar plates
11. Sterile scissors

h. **Expected output and outcome**

5% PVP-I, 10% PVP-I and Lacto Bacillus Clausii Probiotic are expected to exhibit improvement in the tensile strength of uncoated sutures, sutures treated with 5% and 10% Povidone Iodine and Lactobacillus clausii Probiotic at baseline before and after tying a surgeon's knot as well as improve the zone of inhibition after coating as compared to uncoated sutures against Aggregatibacter Actinomycesetemcomitans pathogen, P. gingivalis pathogen, F. nucleatum pathogen

i. **Industry/Institute Collaboration**

- i. Name of the Collaborating Industry/Institute- Dr. Kishore Bhat, Prof & Head of the Department of microbiology
- ii. Collaboration Details- Maratha Mandal's NGH institute of Dental Sciences 7 Research centre, Belgaum, Karnataka-590010
- iii. Additional Details if any –ph 0-0831-2477682 ,drkgbhat@yahoo.com

j. **Funding required from I-STEM (with justification:**

An effective in vitro analysis of sutures coated with 5% PVP-I, 10% PVP-I and Lacto Bacillus Clausii Probiotic can be done to evaluate the mechanical as well as antimicrobial property. To date, there is no evidence of sutures coated with 5% PVP-I, 10% PVP-I and Lacto Bacillus Clausii Probiotic mechanic and on the improvement on its properties. Therefore, I request for a funding on the preparation as well as on the testing of the same.

Details of Requirements & Mode of the Engagement: (Attach the quotation for the consumables)

(i) Short term Engagement: 6 months

a. Usage of testing/characterization facilities across the country (Characterization Mode)

- i. Testing Charges: 1,50,000/- for the antimicrobial assessment and 20,000/- for tensile strength assessment.
- ii. Consumable charges: Rs. 20,000-25,000/-
- iii. Travel Cost (Boarding and Lodging, if any) Rs. 10,000-15,000

b. Usage of fabrication and testing facilities across the country (Fabrication Mode)

- i. Fabrication and testing Charges: Rs. 10,000-15,000/-

- ii. Consumable charges (if any): Rs. 5,000/-
- iii. Travel Cost (Boarding and Lodging, if any): Rs: 10,000-25,000/-

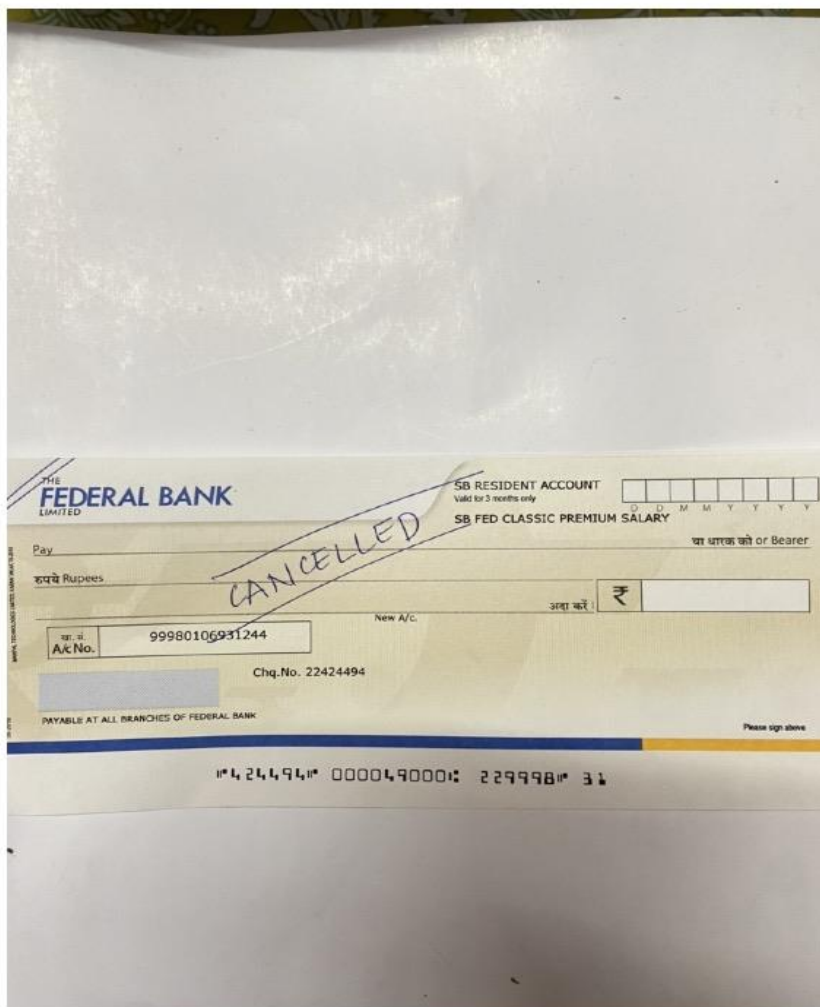
(ii) Medium term Engagement: NIL

- a. Execution of project in any one of the Host Institution (Project Mode)
 - a. Fabrication and or testing Charges
 - b. Consumable charges (if any)
 - c. Travel Cost (Boarding and Lodging, if any)
- b. Execution of project in Multi Host Institutions (Project Mode)
 - a. Fabrication and or testing Charges
 - b. Consumable charges (if any)
 - c. Travel Cost (Boarding and Lodging, if any)

(Round-trip to the Host Institution by 2nd class (Non-AC) railway via the nearest route)

Details of User's Bank Account: SAVINGS ACCOUNT

(Please send a copy of the cancelled cheque/copy of the passbook carrying all the information needed)



Beneficiary Name (User's name) Dr. Jui Vilas Bhandare

PAN: CMKPB2436D

Bank Account No. **99980106931244**

Name of the Branch: Federal Bank, Vashi Branch

IFSC Code: FDRL0001369

Note: Proposed proposal must be executed within stipulated duration (max. 6 month) to avoid fund availability issues. Travel form will be provided by the I-STEM office. The users will submit the technical report, original invoice (duly signed by the Head of the Institution) raised by the Host Institution through I-STEM portal only along with a copy of the travel forms and original tickets through post to the Nodal Officer, I-STEM, Indian Institute of Science, Bangalore. A scan copy of all the documents may be sent in advance.