

**श्री चित्रा तिरुनाल आयुर्विज्ञान और प्रौद्योगिकी संस्थान, त्रिवेंद्रम, तिरुवनन्तपुरम - 695 011, केरल, भारत**

SREE CHITRA TIRUNAL INSTITUTE FOR MEDICAL SCIENCES AND TECHNOLOGY (SCTIMST)

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(An Institute of National Importance under DST; Government of India) (***एक राष्ट्रीय महत्व का संस्थान, विज्ञान एवं प्रौद्योगिकी विभाग, भारत सरकार)***

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**Press Release**

**Sree ChitraTirunal Institute for Medical Sciences & Technology strides ahead in patents**

Sree Chitra Tirunal Institute for Medical Sciences & Technology (SCTIMST), Trivandrum has a unique mandate that combines advanced specialty patient care along with education and research in medical sciences, biomedical technology and public health under a single Institutional framework. The Biomedical Technology Wing of the Institute has been instrumental in developing technologies on medical devices and biomaterials and translating the same to reach the patient population by handholding with the industrial partners. The Institute is leading medical device innovation in the country with 50 patents granted in the current year. This includes four foreign patents in countries like US, European Union, South Africa and Brazil. Sree Chitra has nearly 270 granted Indian Patents, 17 foreign patents, more than 70 Design registrations and many other patent applications in the pipeline. The Institute had received National IP Award earlier in 2019 in the category, “Top R & D Institution/Organisation for Patents & Commercialization These patents not only demonstrate SCTIMST’s commitment to innovation but also underscore the importance of intellectual property (IP) in fostering technological progress and ensuring that novel solutions are protected and commercialized effectively. Through strategic agreements and Memorandums of Understanding (MOUs) with leading corporate entities, SCTIMST has successfully licensed and commercialized many of its patented technologies. These collaborations have enabled the widespread adoption of innovative medical devices, enhancing healthcare accessibility and affordability. The Institute has signed 73 Technology Transfer agreements with medical device industry as on 2024 majorly in the cardiovascular, orthopaedic, dental, In vitro Diagnostic Devices etc.Apart from this during the covid pandemic the Institute had developed many technologies which supported the diagnosis and treatment of covid. The institute's dedicated research teams work tirelessly to create solutions that address pressing healthcare challenges, improving patient outcomes and saving lives.

The following technologies were linked with the medical device industry for Technology Transfer/collaborative development

1. **“Bioactive HA-TCP ceramic beads for drug delivery”**

Calcium phosphate bioceramics, mainly based on the combinations of hydroxyapatite (HA - the bone mineral) and tricalcium phosphate (TCP), are more popular as bone graft substitutes. Generally, these will be in granule form with porous structure. Despite the wide acceptance as bioactive bone graft substitutes, conventional porous HA-TCP ceramics are not suitable for drug delivery in bone infection cases, because of lack of control over drug elution. Acrylic cement beads are used in such cases of osteomyelitis, which are to be removed after the drug delivery action through a second surgery.

Research team of SCTIMST has developed a patented technique of making HA-TCP bioactive beads intended for drug delivery in bone infections (osteomyelitis). The specially designed process allows the formation of globular shapes when a calcium phosphate slurry in a specific composition is dropped on a super-hydrophobic powder bed. The dried ‘green globules’, upon firing at high temperatures, form ceramic beads having multi-modal porosity (from micro to nano pores, in a graded manner). Drugs in liquid form could be loaded in them through vacuum-impregnation method and implanted at the infected site. After achieving the infection control through drug delivery, the beads will remain at the site as osteoconductive and resorbable grafts which will integrate with the bone.

This innovative technique of HA-TCP bead preparation is automated using a pneumatic controlled auto-dispenser system, so that beads of uniform sizes could be obtained (3 - 6mm). Sizes can be adjusted on a case to case basis during batch production. Candidate antibiotics were loaded into the beads and the *in vitro* drug elution lasted to a period of 20 days.

The technology of **Bioactive HA-TCP ceramic beads for drug delivery was transferred to M/s Onyx medicals Pvt Ltd, Meerut, UP.**

**PI: Dr.HarikrishnaVarma P R, Head, BMT Wing and team**

1. **Automatic contrast injector**

Coronary angiography and angioplasty are the most common procedures in a catheterization lab. During this procedure, the performing physician aspirates angiographic contrast into a syringe and injects it through the catheter into the coronary artery and simultaneously do fluoroscopy and acquires the cine-run. Simultaneously he has to monitor the pressure at the tip of the catheter also. As of now, most of the contrast injections performed in India as well as in developing countries are manual. The clinician has to do this process multiple times during an angiographic procedure which results in long time duration, fatigue and injuries. It is envisaged that the increased speed of the procedure thereby resulting in improved patient outcomes can be obtained by automating the process. Automated contrast injectors that serve the purpose are currently not available. The imported devices are very costly.Considering this unmet clinical need, SCTIMST has developed a hand held automatic contrast injector.  The device is a Class C medical device intended for Automatic delivery of Contrast agents for facilitating coronary angiography and angioplasty.

The device consists of a handheld power drive and a disposable manifold. The disposable manifold directs the contrast agent to the catheter during delivery and sucks the contrast agent from the reservoir. The power drive can be triggered using simple tactile methods to push the contrast agent at a clinically required flow rate against the blood pressure. The device is designed to have a sterile placement of the manifold and the syringe combination to be used in the clinical environment.

The technology of Automatic contrast injector was transferred to M/s Cyrix Healthcare Pvt Ltd, Kochi for commercialisation.

**Principal investigator: Mr Sarath S Nair and team**

1. **Gelatin modified bioink for 3D bioprinting** - ChitraGelMAUVS Bioink

This technology is related to a product known as 'Bioink', which is developed for creating live tissues through a cutting-edge technology called Three Dimensional (3D) Bioprinting. The main ingredient in the bioink is chemically modified gelatin called GelatinMethacrylamide or GelMA. After the 3D printing live cells usingGelMA, the resultant living structure is stabilized through crosslinking by exposure to Ultra Violet (UV) light, acrucial step can potentially impact viability of the cells. This product signifies a novel formulation that contain GelMA and additives that safeguard cells from UV exposure while preserving the efficacy of the crosslinking. Referred to as Chitra-GelMA UVS, this bioink is provided in the form of dry flakes that easily dissolve in an aqueous medium. The bioink has been evaluated for its appropriateness for 3D Bioprinting. It has been successfully tested for creating complex tissues such as the liver that expressed liver specific functions. Key features of this bioinkareeasily soluble, cell friendly, photocrosslinkable, UV safe to viable cells, 3D printable, adjustable fluidity, room temperature printing, consistent performance, biodegradable and enzyme digestible.

1. Indian patent entitled "A Hydrogel System for Three-Dimensional Printing” Inventors: Shiny Velayudhan, Anil Kumar PR, Kumary TV and Kalliyana Krishnan V has been granted. Patent number 458341; Date of Grant: 11/10/2023.

The technology ofChitraGelMA UVS Bioinkwas transferred to M/s Scire science Pvt Ltd, Kalamasseri, Kochi

**Principal investigator: Dr Anilkumar PR & Dr Shiny Velayudhan and team**

1. **Automated trolley e drive for patient transport**

The Automated trolley e drive for patient transport was a system developed by SreeChitraTirunal Institute for Medical Sciences and Technology (SCTIMST) in collaboration with Government Engineering College Barton Hill (GECBH) for enhancing easy and safer patient-transportation in hospital premises, using a 3-wheeled universally connectable electric powered machine, which could be connected to any kind of patient stretcher. Insights from Doctors and medical professionals working at Hospitals were collected to infer that the supporting hospital staffs usually have to work very hard to push stretchers through highly inclined steeps of the hospital floors and premises. This creates a tiring and unsafe condition for the patient and working professionals. This also delays the timely arrival of the patient to the doctor especially during emergency cases. The design involved clamps attached to arms extended from the system whose height and angles could be adjusted such that it could effortlessly connect to any type of patient stretcher. A rechargeable battery drives the motor which provides controlled acceleration. This together with a breaking system allows for safe driving in ramps and busy hospital corridors.

The technology of **Automated trolley e drive for patient transport** was transferred to M/s Quasys software & consultancy Pvt Ltd

**Principal investigator: Dr Smita V and team**

1. **Virtual reality tool for surgical planning and medical teaching**

SCTIMST in collaboration with Government Engineering College Barton Hill (GECBH), has introduced an innovative 3D visualization tool tailored for medical teaching and preoperative surgical planning. It is a testimony to SCTIMST’s continuing efforts to integrate engineering skills and medical sciences in order to improve health care diagnostics and patient care outcomes. The two institutions have submitted a joint patent application for this system. This initiative stands as one of the initial successful endeavours in the country, offering clinicians advanced insights into a patient's anatomy and pathology which is useful for planning surgical treatment for various diseases.

A tripartite MoU was signed between SCTIMST, GECBH and M/s EmbeditePvt. Ltd for further development of our software on 14th September 2023.

The following features makes it distinct:

• Affordability/Low cost: The software doesn’t need a computer with high end configuration to run. All it requires is a pair of overhead projectors, a computer, a screen for projecting 3D image and 3D glass. The soft ware can convert CT and MR images to 3D images and allows for visualisation of the images in any angle and traversing the image to high light the area of interest through any plane and axis.

• Portability: This tool can run on any windows 10 computer, which can be connected to pair of projectors. This simple set up can be used for departmental discussions and teaching.

Now this tool is being extensively used in our DM Cardiology teaching for their preprocedural planning and case discussions and MBBS, MD (Anatomy), nursing staff and interested PhD and technical staff for learning anatomy.

**Principal investigator: Dr Kesavadas C and team**

1. **Chitra Peacock Retractor**

Brain surgeries are complex procedures that often require the retractors to access and visualize the surgical field. The conventional single-blade retractor is commonly used for tumour exposure which often blocks the surgical views, especially in cases of deep-seated tumours. The Peacock Retractor addresses this issue with its unique design, featuring a flexible arm and an innovative 360-degree expansion mechanism that enhances access and visibility in the surgical field. The retractor's blades are designed and arranged, to distribute pressure uniformly across the surrounding tissues, thus reducing the risk of focal pressure exertion and brain tissue injuries.

The three-dimensional 360-degree expansion mechanism enables the retractor to expand from a small to large diameter, making it suitable for removing deep-seated tumours during surgeries. This mechanism also creates space between the blades, allowing surgeons to excise tumours more effectively. This innovation is Chitra's patented technology, which was granted in April 2024.

This technology was initially developed for neurosurgeries but has broader applications. With suitable modifications, it can be used in various surgical specialties, including general surgeries, orthopaedic surgeries, minimally invasive surgeries etc. This technology holds particular significance in India, where the frequency of general surgeries performed per lakh population per year is over 3,500 and also over twenty thousand neurosurgeries are performed annually. Also, the conventional single-blade brain retractors are priced at nearly 1.2 lakhs. Therefore, this innovation aims to reduce overall costs, dependency on imports, and improve surgical efficiency to enhance patient care.

Additionally, a memorandum of understanding (MoU) has been signed with South Indian Surgical Private Limited, Chennai (SISCO), for co-development, testing, and commercialization of this technology.

**Principal investigator: Dr ArvindkumarPrajapati and team**