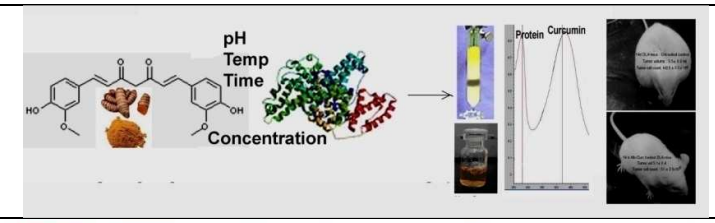
Technologies awaiting Transfer / Relicense

The technologies in this section are in the advanced stages of development.

Looking forward for industrial partner for commercialisation

Albumin as curcumin delivery vehicle for anti-cancer activity



Most of the anti-cancer drugs cause major side reaction inducing death of many cell types; therefore, intense research discovered new molecules but with various limitations. Curcumin is a natural molecule that proves potential anti-cancer properties for human use. But its poor aqueous solubility and bioavailability limits its effective use. Therefore, technology for producing water soluble curcumin without losing its drug action has great medical significance.

Product description & Salient feature

Chemical-free conjugation to native albumin with high binding efficiency to achieve high concentration of biologically active curcumin in aqueous medium. Curcumin solubility is 100 fold higher than free curcumin. . Internalization of Curc-Alb into the cancer cell has been demonstrated. Action of Curc-Alb on cancer cells has been established *in vitro* and *in vivo*. No study has reported earlier that conjugated albumin has anticancer and anti-angiogenic activity at a concentration which is non-toxic to primary fibroblast.

Novelty of the product

Human albumin in its native form and pH is used for conjugation of CurcuminAlbumin naturally get concentrated at the tumor site. Albumin infusion to cancer patients is a standard therapeutic method. So transfusion of Curc-Alb conjugate has limited hazard to the patient as compared to many caustic drugs given for treatment.

Patents:

(i) Alb-Curc (PCT/IN2014/000338)

Future work

Animal studies to determine pharmaco-kinetics and pharmaco-dynamics of the drug for safe dose and repeat dose calculations is pending. Drug Controller approval for limited clinical trial needs to be initiated.

Technology Readiness Level

TRL5

Fibrin Wafer for curcumin delivery

Need Identified

Cancer metastasis after surgical resection of cancer tissue is a major health problems leading to mortality.

Most of the anti-cancer drugs cause major side reaction mainly because the drug is toxic to many cell type. Therefore, local delivery of cancer drug at the site of surgery has major effective implications in cancer treatment to prevent remission. Curcumin conjugated to human albumin (Curc-Alb) has potent apoptotic effect on cancer cell which can be used to prevent and treat cancer. Technology for effective sustained drug delivery of Curc-Alb at the site of resected tumor promises major medical significance.

Product description & Salient features

Fibrin wafer incorporated with Curc-Alb has been designed to be implanted at the surgical site. Because Curc-Alb is highly soluble is water, it is mixed with components of Fibrin Sealant, i.e. Fibrinogen Concentrate and Thrombin at specific composition, that clots upon mixing. The lyophilization of clot produces a wafer from which drug release has been demonstrated for over a period of up to 50 days.

Salient features are fibrin is adhesive to surgical, bleeding tissue; so, application is easy. Added advantage is it can be hemostatic and helps in arresting excessive bleeding.

Novelty of the product

A single product for inducing haemostasis and for sustained release of a proven drug in

soluble form. Constructed using only human proteins in a stable, ready-to-use form.

: (i) Alb-Curc (PCT/IN2014/000338) ; Fibrin wafer / disc (PCT/IN2014/000338)

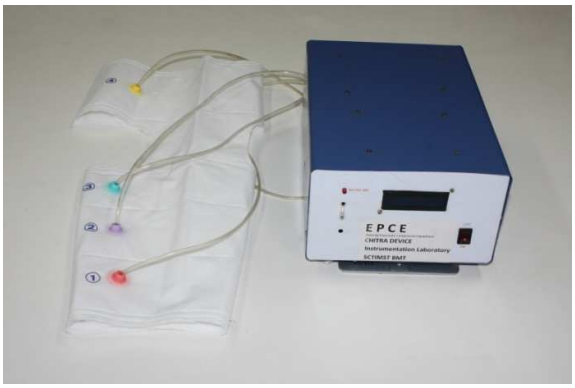
Future work

DCGI approval for clinical trial

Technology Readiness Level

TRL5

External Pneumatic Compression Equipment for Deep Vein Thrombosis (DVT) Prophylaxis



Device Classification: Class II

Deep vein thrombosis (DVT) occurs when a blood clot (thrombus) forms in one or more of the deep veins in the body, usually in legs. In Deep vein thrombosis blood clots in the veins can break loose, travel through the bloodstream and lodge in the lungs, blocking blood flow (pulmonary embolism).Deep vein thrombosis (DVT) is a serious disorder with an estimated annual incidence of 1 per 1,000 persons per year and a lifetime incidence of 2% to 5%.The major outcomes include mortality, thromboembolism and bleeding.

This pneumatic compression device is designed to improve venous circulation in the limbs of patients suffering from Deep Vein Thrombosis.The product consists of the following features:

- A soft starting air pump for better efficiency
- Wider pressure range: 20mmHg to 120mmHg
- Programmable sequence as per user needs
- Programmable pressure levels
- Noise < 55 dB
- Alarm mechanisms
- Portable and power backed

The set of bladders (foot/ ankle or calf) within the cuff are inflated with a rise time of approximately 300 milliseconds (0.3 seconds). The leftmost bladder is inflated first followed by the next bladder. All bladders have their pressure maintained for some seconds. The first bladder is deflated first followed by the second bladder. Inflation pressures can be set in site and can range from 20 to 100 mmHg. The bladders are deflated to approximately 6 mmHg for 60 seconds which allows for venous filling. It also helps the bladders to fill rapidly with

less air. A smaller quieter pump is therefore possible. The calf bladder is inflated through a fitting that is on the distal portion of the bladder.

The bladder fills with air from the distal to the proximal calf. That coupled with the initial inflation of the foot/ankle bladder creates what is called progressive compression which returns the venous blood quickly and efficiently toward the heart.

Novelty of the product

Indian Patent filed

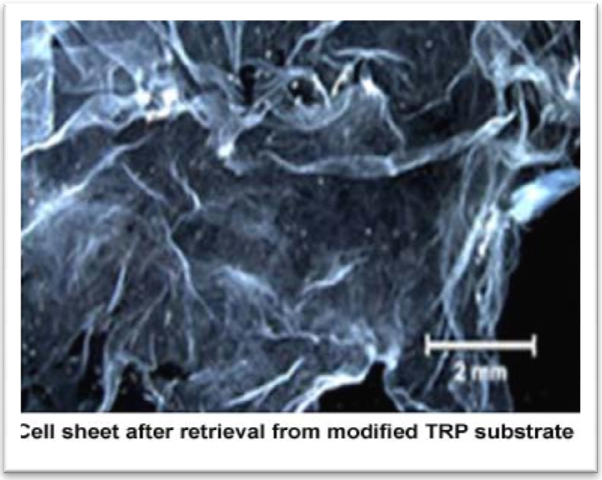
An external pneumatic compression device for prevention of deep vein thrombosis, 046/CHE/2014

Technology Readiness Level

TRL-3: In vitro evaluations are progressing. Completion of TRL4 is anticipated within 3 months

Culture Substrate for Cell Sheet Engineering

Device Classification: Class II



Cell sheet after retrieval from modified TRP substrate

The cells maintained in vitro in culture dishes is harvested conventionally using enzymatic /mechanical disruption for further applications, disturbing the cell-cell and cell-extra cellular matrix interactions and converting the cell monolayer to single cell suspension. Harvesting cells in monolayer or multilayer form would retain the cell re-adhesion ability, viability and tissue specific functions. The technology presented is a method to prepare Temperature Responsive (TR) cell culture substrate that enables the harvest of monolayer or multilayer cell constructs without using the conventional enzymatic method. The key component of TR substrate is a novel intelligent polymer that exhibits a reversible hydrophobic to hydrophilic phase change upon temperature variation in the presence of an aqueous environment. The TR substrate has been evaluated for its suitability for cell culture using variety of cell lines, differentiated primary cells and stem cells.

The efficacy of TR substrate has also been evaluated for therapeutic application by transplantation of corneal construct to rabbit ocular surface disease model after harvesting from the TR substrate. The technology will be useful for

- research on cell-cell interaction
- drug screening
- development of transplantable tissue construct to repair or regenerate damaged/diseased tissues.

Novelty of the product

Chemistry, composition and process of cell sheet transfer
Indian Patent filed

Patent Number 241610: An Improved Method For The Synthesis Of Temperature Sensitive Poly (N-isopropylacrylamide) (PIPAAM) Coating On Polymeric Materials

Technology Readiness Level

TRL-4: Proof of concept completed. Scale up method for mass production has to be developed

Hydroxyapatite Porous Granules (size range 2mm- 3mm)

Device Classification: Class II

Hydroxyapatite derived materials has been used widely as synthetic bioactive materials fororthopaedic applications due their molecular structural and compositional similarity with themineral part of the bone. Porous granule form of hydroxyaptite is a general purpose syntheticbone graft material. The domestic manufacture of hydroxyaptite is in the minimal scale in India.

Intended application

As a synthetic bone graft material for orthopaedic applications such as bone graft substitutionand bone defect filling.

Product description & Salient features

In the present technology, basic hydroxyaptite powder is produced by wet chemicalprecipitation technique under optimized conditions to yield precipitated particles composedof nanocrystals. Optimized quantity of pore-former of suitable size range is incorporatedduring fabrication so as to get ceramic bodies of 60-70% porosity and pores in the size 150-300μm. The granules are produced from the sintered porous discs by cracking into smallerpieces of irregular surface.The granules are characterized for phase purity, crystallinity, porosity, trace level heavy metalcontent and biocompatibility.

Novelty of the product

Indigenously developed process. Indian Patent filed on hydroxyapatite synthesis technology.

Technology Readiness Level: TRL9 Ready for transfer (This product has been approved by the Drug Controller General of India for marketing).

Transferred to industry, multiple technology transfers are envisaged

Hydroxyapatite Porous Blocks (10mm cubes with of 200µm porosity)

Device Classification: Class II

Hydroxyapatite derived materials has been used widely as synthetic bioactive materials fororthopaedic applications due their molecular structural and compositional similarity with themineral part of the bone. Hydroxyapatite in block form is a general purpose graft materialwhich is in frequent use in orthopedics.

Intended application

As a synthetic bone graft material for orthopaedic applications suchas bone graft substitution.

Product description & Salient features

In the present technology, hydroxyaptite powder is produced by wet chemical precipitationtechnique under optimized conditions. The blocks are fabricated using a novel gel-castingtechnique which impart a porosity bulk porosity 60-75 % v/v, with interconnected poresranging from 50 -200µm. The blocks are characterised for phase purity, crystallinity, porosity,trace level heavy metal content, mechanical strength and biocompatibility.

Novelty of the product

Indigenously developed process. Indian Patent filed on hydroxyapatite synthesis technology.

Technology Readiness Level: TRL9

Ready for transfer (This product has been approved by the Drug Controller General of India for marketing).Transferred to industry, multiple technology transfers are envisaged

Dense bioceramic laminoplasty spacers

Device Classification: Class II

Product description & Salient features

Degeneration of the vertebral bodies often lead to compression of spinal cord and relatedcomplications. In order to release the compression, laminectomy surgery is done and spacersare placed. Biocompatible ceramics are the only options as the spacer material.

Intended application

These are biocompatible, osteoconductive ceramic wedges with high mechanical strength toprovide support to the vertebra after laminectomy surgery.

This is a wedge-like dense hydroxyapatite ceramicshape useful in plugging the gap in vertebra arising during laminectomy procedure.

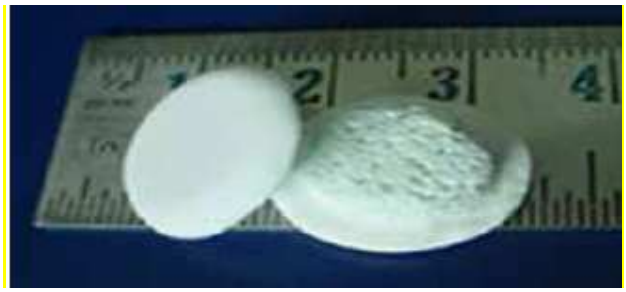
Novelty of the product

The technology involves special processes to make highly dense hydroxyapatite ceramic bodies,so that they have high mechanical strength and physiological stability. The mechanicalproperties and biocompatibility are tested and proven in the lab.

Technology Readiness Level: TRL9

Industry Partner identified: Transferred to industry, multiple technology transfers are envisaged

Bilayer Ceramic Buttons for Cranial Burr-hole Closure.



Device Classification: Class II

During cranial surgery, burr-holes are made which are normally not repaired. The open burr holeswill heal eventually, but will lead to deformity, cosmetically unappealing. The 'Burr-holebuttons' enable healing of the burr-holes without any cosmetic deformity.

Intended application:

For filling cranial bone defect (burr-hole) arising during neuro/brain surgery.

Product description & Salient features

The product is basically a plug made out of hydroxyapatite. It is made in mushroom-likeshape having a bi-layer structure with a dense upper layer and a porous lower layer. This isdesigned as monolithic structure using a special slip-cast technique.

Novelty of the product

This is a unique design, made in India for the first time.

Technology Readiness Level: TRL9

Ready for transfer (This product has been approved by the Drug Controller General of Indiafor marketing).Transferred to industry, multiple technology transfers are envisaged

Bioactive Composite (calcium-phospho-silicate) Granules (size range 2mm-3mm)

Need Identified :

Hydroxyapatite granules are used in orthopedics as bone graft substitute in bone defect repair. However, natural in vivo resorption of hydroxyapatite in ceramic form is slow and remnants may remain at the surgical site for long time.

Bioactive composites containing silica, in addition to apatites, has faster resorption and hence more advisable as a graft material.

Classsification:

Class II

Intended application:

As a synthetic bone graft material for orthopaedic applications such as bone graft substitution and bone defect filling.

Product description & Salient features:

The material contains nano level composite of hydroxyapatite, tricalcium phosphate and calcium silicate, manufactured through solid phase reaction between hydroxyapatite powder and bioactive glass powder (having calcium, phosphate and silica). It is converted to porous granule form by incorporating pore formers. The material is found to be bioactive and fast resorbing compared to bare hydroxyapatite ceramics.

Novelty of the product: This is a new class of synthetic bone-graft material developed through in house research. Patent filed on bioactive glass synthesis technology.

Development stage:

Ready for transfer (This product has been approved by the Drug Controller General of India for marketing).

Technology Readiness Level

TRL9

Industry Partner identified

Transferred to industry, multiple technology transfers are envisaged

Bioactive Composite (calcium-phospho-silicate) Blocks (10mm cubes with o 200µm porosity)

Need Identified :

Hydroxyapatite blocks are used in orthopedics as bone graft substitute in bone defect repair. However, natural in vivo resorption of hydroxyapatite in ceramic form is slow and remnants may remain at the surgical site for long time. Bioactive composites containing silica, in addition to apatites, has faster resorption and hence more advisable as a graft material.

Classification:

Class II

Intended application:

As a synthetic bone graft material for orthopaedic applications such as bone graft substitution.

Product description & Salient features:

The material contains nano level composite of hydroxyapatite, tricalcium phosphate and calcium silicate, manufactured through solid phase reaction between hydroxyapatite powder and bioactive glass powder (having calcium, phosphate and silica). This is made in porous cube shape through ceramic processing.

The material is found to be bioactive and fast resorbing compared to bare hydroxyapatite ceramics.

Novelty of the product:

This is a new class of synthetic bone-graft developed through in house research. Patent filed on bioactive glass synthesis technology.

Development stage: Ready for transfer (This product has been approved by the Drug Controller General of India for marketing).

Technology Readiness Level

TRL9

Industry Partner identified

Transferred to industry, multiple technology transfers are envisaged

BONE DEFECT FILLER FOR PERIODONTAL/ MAXILLOFACIAL APPLICATIONS

Fine Granules of Bioactive Composite (size range 350-700mu)

Need Identified :

Periodontal defects and periapical cysts are common problems observed in dentistry. Hydroxyapatite in fine granule form is used for the management of these defects. Bioactive composites are improved material for the same purpose, which will enable faster healing.

Classification:

Class II

Intended application :

For filling periodontal defects, extraction sites and ridge augmentation. Also useful in filling peri-apical cysts.

Product description & Salient features :

The material contains nano level composite of hydroxyapatite, tricalcium phosphate and calcium silicate, manufactured through solid phase reaction between hydroxyapatite powder and bioactive glass powder (having calcium, phosphate and silica).

It is converted to composite ceramic form and crushed and graded to obtain the granules.The material is found to be bioactive and fast resorbing compared to bare hydroxyapatite ceramics.

Novelty of the product:

This is a new class of synthetic graft material developed through in house research. Patent filed on bioactive glass synthesis technology.

Development stage:

Ready for transfer (This product has been approved by the Drug Controller General of India for marketing).

Technology Readiness Level

TRL9

Industry Partner identified

Transferred to industry, multiple technology transfers are envisaged

Self-setting Calcium Phosphate Cement Putty

Device Classification: Class II

Periodontal defects and periapical cysts are managed in dentistry using bioactive ceramic grafts. However, ceramic materials in fine granule form pose difficulty in transfer and defect re-build in actual clinical situation. A mouldable bioactive cement material will be ideal for this requirement. A self-setting putty which solidifies into bone mineral has been designed for the purpose. To be used as a mouldable self-setting cement/putty for periodontal defect reconstruction, extraction socket filling and periapical cyst filling.

Novelty of the product

Indian Patent filed

Technology Readiness Level

TRL-9: Ready to transfer

Self-setting Bioactive Paste for Root Canal Filling

Device Classification:Class II

Root canal filling pastes are frequently used endodontic surgery to seal the root canal of pulp-infected tooth and to save it from extraction. An ideal root filling material should be able to administrate easily into the canal, should provide perfect sealing of the canal laterally as well as apically and should not shrink after application. The product is a composite of plaster of Paris, calcium hydroxide, strontium phosphate (in-house synthesized) and bioactive glass in optimized ratios. It possesses most of the ideal qualities of the root canal sealer. The filler has been tested for flow, workability, setting time, dimensional change and solubility. The properties comply with ASTM-ADA standard.

Novelty of the product

International/Indian Patent filed

Technology Readiness Level

TRL-4: In Vitro studies and one preclinical animal study are completed.

Injectable Calcium Sulfate-based Cement for Dental and Orthopedic Applications

Need Identified :

Bioactive ceramic grafts are used widely for bone defect repair in orthopedic, spine and maxillofacial surgeries. However, ceramic materials are rigid and difficult to place in certain sites. Also, ceramics may leave out gaps and do not form exact contours. A mouldable bioactive cement material will be helpful in grafting inaccessible sites and to build contours. Injectability will enable minimally invasive defect repair. A novel Injectable Calcium Sulfate-based Cement has been designed which solidifies into bone mineral.

Classification:

Class II

Intended application :

To be used as a bone defect filler cement for bone grafting procedures in orthopaedics and periodontal defect management in dentistry

Product description & Salient features:

This is a simple and affordable bone filler cement based on calcium sulfate. Conventional calcium sulfate hemihydrate is a cementing material in presence of water but it resorbs fast when implanted in bone defects before bone repair get completed. Pure calcium sulfate is made in-house and is modified with hydrogen orthophosphate ions so as to impart better biocompatibility and slower resorption.

The freshly mixed cement paste is injectable through an 18 gauge needle from a syringe. When implanted in rabbit bone, a complete healing is seen within 52 weeks.

Novelty of the product:

This Calcium Sulfate-based Cement has been developed through in house research. Patent for the production of calcium sulfate material is filed.

Development stage:

Ready for transfer. Clinical trials ongoing.

Technology Readiness Level

TRL6

Industry Partner identified

No

Injectable Calcium Phosphate Cement

Device Classification: Class II

A mouldable bioactive cement material will be helpful in grafting inaccessible sites and to build contours. Injectability will enable minimally invasive defect repair. An Injectable Calcium Phosphate Cement has been designed which solidifies into bone mineral.

The product is a mouldable self-setting material with powder and liquid components. On mixing, it will form a paste which will set into hydroxyapatite. The paste, before setting, is injectable though narrow needles from an applicator. This enables minimally invasive surgery.

Novelty of the product

International/Indian Patent filed

Technology Readiness Level

TRL-7:Clinical trials completed and ready to transfer

Recombinant proteins: Transformation growth factor-alpha (TGF-alpha) and Vascular endothelial Growth Factor (VEGF)

Recombinant human TGF-alpha and VEGF were developed using genetic expression in prokaryotic system. The proteins found to be functionally active and can be easily purified using chromatographic techniques. Wound healing assay showed excellent results

Novelty of the product

Both these recumbent proteins are developed by a cloning strategy by which we could develop the functionally active recombinant peptides (similar to the native post-translated modified peptides).

International/Indian Patent filed

Technology Readiness Level

TRL-4:The technology is at proof of concept stage. Expected to complete the evaluations within a year

Immunoisolation bags/prototype biohybrid pancreas

Device Classification:- Class III

The immunoisolation bag is used to contain and protect functional secretory cells from rejection by the immune system. The bag is permeable to the transport of the secretory lower molecular weight (less than 20Da substances) and impermeable to higher molecular weight substances.

Hence can be fashioned as a biohybrid pancreas or a depot for the controlled release of dopamine or chromaffin etc.

An implantable device that is non toxic and non degradable that is semipermeable to low molecular weight drugs, proteins and enzymes and is also impermeable to higher molecular weight immunoglobulins. The device is in the form of a bag and can also be fabricated in different other shapes.

Novelty of the product

International/Indian Patent filed

Technology Readiness Level

TRL2

Visible light cure dental restorative composite based on organically modified ceramic resin with low polymerization shrinkage and better adhesion to tooth (Ormo48)

Device Classification: Class II

Ormo48 is a visible light cure non-radiopaque dental restorative composite.It is used for the development of a non-radiopaque bioactive composite with low polymerization shrinkage and better physico-mechanical properties. It can be applied all types dental restorations due to its good handling properties .This products contain no Bisphenol A, no Bis-GMA, no BPA derivatives, All the materials can be polymerized using visible light The shelf life period of the composite has evaluated and found to be more than three years.

Novelty of the product:

No Bisphenol A, no Bis-GMA, no BPA derivatives, can be polymerized using visible light.

Conventional restorative materials are based mainly on organic resins such as BisGMA or UDMA and inorganic fillers like quartz or glass. Although these conventional restorative materials have proven to be highly effective at preserving teeth, they have a limited life-span and ultimately require replacement. Ineffective bonding with the inorganic filler and organic matrix is one of the main causes for polymerization shrinkage. Most common reasons for secondary caries are polymerisation shrinkage of dental composites and biofilm (plaque) formation on the margin of the tooth and restoration. Moreover, a significant percentage of these restored teeth ultimately undergo pulpal necrosis, requiring either tooth extraction or endodontic treatment and prosthetic build up. Therefore, development of novel techniques to regenerate, as opposed to repairing, lost tooth structure would have significant benefits.

Technology Readiness Level

TRL-4: Completed all the physico mechanical,invitro and invivo biocompatibility evaluation including Pulp and Dentin test in Dog model and histopathology evaluations as per the international standard. Ethics committee clearance and Limited clinical trials have to

be initiated.

Indian Patent filed

Granted Indian Patent (No. 219733)

Visible light cure Radiopaque composite based on Ormoresin with low PS and better durability (Lisormer)

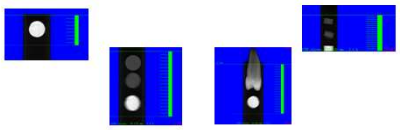
Device Classification:Class II

This product is a visible light cure radiopaque composite with low polymerization shrinkage and better physico-mechanical properties. The composite can be applied to larger cavities and root canal applications. Ideal for all restoration classes.The radiopacity is equivalent to 1.5mm of aluminum.

Novelty of the product:

No Bisphenol A, no Bis-GMA, no BPA derivatives, Can be polymerized using visible light.

Conventional restorative materials are based mainly on organic resins such as BisGMA or UDMA and inorganic fillers like quartz or glass.The new material is a tooth compatible three-dimensional cross-linked photopolymerized polymer based dental composite. The photopolymerized polymer was formulated using novel photopolymerizable resin.



Technology Readiness Level

TRL-4:Completed all the physico mechanical,invitro and invivo biocompatibility evaluation including Pulp and Dentin test in Dog model and histopathology evaluations of the non -radiopaque composite based on this resin as per the international standard. One granted

Indian Patent (Patent Number 219733, Inventors:P.P.Lizymol and V.KalliyanaKrishnan). As the combination of fillers used in radiopaque composite is a proved biocompatible material, further large animal studies not required. New patent application is filed. In vivo biocompatibility evaluation (small animals) is ongoing

Indian Patent filed

One granted Indian Patent:Patent Number 219733.

VLC Bioactive Composite (Dentactive)

Device Classification:Class II

This product-Dentactive is bioactive, radiopaque composite with low polymerization shrinkage and better physic-mechanical properties for restorative applications.It can be applied to larger cavities and root canal applications. Ideal for all restoration classes.

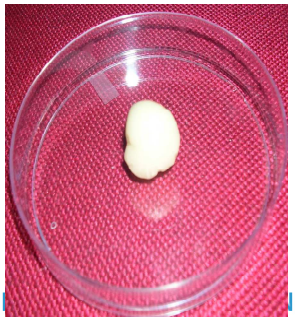
Novel bioactive visible light cured dental composites- Dentactive were based on novel bioactive inorganic-organic hybrid resins containing metal core with polymerizable methacrylate groups synthesized through a modified sol-gel method which is a simple process. These bioactive products actively participate in the cycles of ionic exchange that regulate the natural chemistry of our teeth and saliva and contribute to the maintenance of tooth structure and oral health. Bioactive dental materials stimulate apatite formation that fills gaps, seals margins against microleakage, and helps rebuild teeth. Bioactive materials that are strong, esthetic, and long-lasting offer an alternative to traditional composites, which are strong and esthetic but are passive and without bioactive potential . Dentactive seals margins against microleakage, secondary caries, and failure.responds to pH cycles and plays an active role in maintaining oral health with release and recharge of significant amounts of calcium, and phosphate. These mineral components stimulate formation of a protective/connective apatite layer and a natural bonded-seal at the material-tooth interface.Remarkable advantages are

- Non-sticky, good marginal adaptation
- Less shrinkage than conventional composites
- Very good dentine and enamel bonding with Sted Bond
- High shade matching and colour stability

Novelty of the product:

No Bisphenol A, no Bis-GMA, no BPA derivatives, can be polymerized using visible light.

The novelty of the work is the development of bioactive visible light cure dental composites having better physico-mechanical properties, low polymerisation shrinkage, non-cytotoxic in nature and better cell adhesion compared to the conventional dental composites.



The novel bioactive visible light cured dental composites were based on novel bioactive inorganic-organic hybrid resins with polymerizable methacrylate groups synthesized through modified sol-gel method.

Technology Readiness Level

TRL-4:In vitro and in vivo studies completed. IEC clearance and Limited clinical trials have to be initiated.

Indian Patent filed: Application Number 4996/CHE/2014 (Patent application filed)

Bioactive Composite with Antimicrobial properties (Biodentamer)

Device Classification: Class II

Biodentamer exhibited antimicrobial property compared with control Bis GMA based composite when exposed to E.coli ATCC 25922 bacteria for an exposure of 1 hour. Its functionality are:

- The refractive index of the inorganic-organic hybrid resin is comparable with inorganic fillers.
- Physicomechanical properties like Diametral tensile strength, flexural strength, hardness, polymerization shrinkage,depth of cure, water sorption and solubility were evaluated and the properties meet the criteria stipulated as per the standards
- Composites exhibited lower polymerisation shrinkage compared to control Bis GMA based composite.
- In vitro studies of the composites using L929 cells illustrated that the composite is non toxic in nature with good metabolic activity. The in vitro cell adhesion studies proved that the composite showed good cell adhesion as L929 cells adhered and spread well on it.
- Bioactivity studies were also conducted after storing in Simulated Body Fluid and material showed good bioactivity.

Advantages

- Esthetic
- Chemically bonds
- Seals teeth against bacterial leakage
- Releases/recharges calcium and phosphate
- Provides long-term patient benefits

Novelty of the product:

No Bisphenol A, no Bis-GMA, no BPA derivatives, can be polymerized using visible light.

The novelty of the work is the development of bioactive visible light cure dental composites having better physico-mechanical properties, low polymerisation shrinkage, non-cytotoxic in nature, better cell adhesion and antimicrobial properties compared to the conventional dental composites. The novel bioactive visible light cured dental composites were based on novel bioactive inorganic-organic hybrid resins with polymerizable methacrylate groups synthesized through modified sol-gel method for dental restorative applications.

When the pH is low, the demineralization process releases calcium and phosphate ions from the tooth surface. As the pH rises, these ions are available to interact with fluoride ions in our saliva. Saliva is a natural caries protection agent and contains the minerals that maintain the integrity of the enamel surface.It helps maintain the health of the hard and soft tissues, removes waste, and protect against microbial invasion.

Bioactive dental materials help regulate the chemistry of teeth and saliva and contribute to the remineralization

Technology Readiness Level

TRL-4: In vivo test (Pulp and dentined test in Dog Model with the permission of CPCSEA) have to be completed. B forms have to submit before proceeding for in vivo tests. IEC clearance and Limited clinical trials have to be initiated

Indian Patent filed

Patent Application Number 4027/CHE/2014 (Patent application filed)

Chitra Vein Viewer

Device Classification: Class II

Locating veins is the first step to a successful venipuncture procedure. In many cases, especially with less skilled nursing staffs, multiple pricks are done and infection is common. The task becomes highly challenging for pediatric cases where the veins are not visible with naked eyes. Vein Viewing becomes highly necessary for such situations to locate veins that are clinically relevant to a peripheral procedure. Vein Viewing can Increase first prick success by up to 100% and decrease medically unnecessary PICC lines by greater than 30%.

Chitra Vein Viewing system is developed to cater the need of the nursing staffs to locate the clinically relevant veins for adults and pediatric patients. The handy system with high quality display uses state of the art technology to detect blood vessels.

Technology Readiness Level : TRL 3