

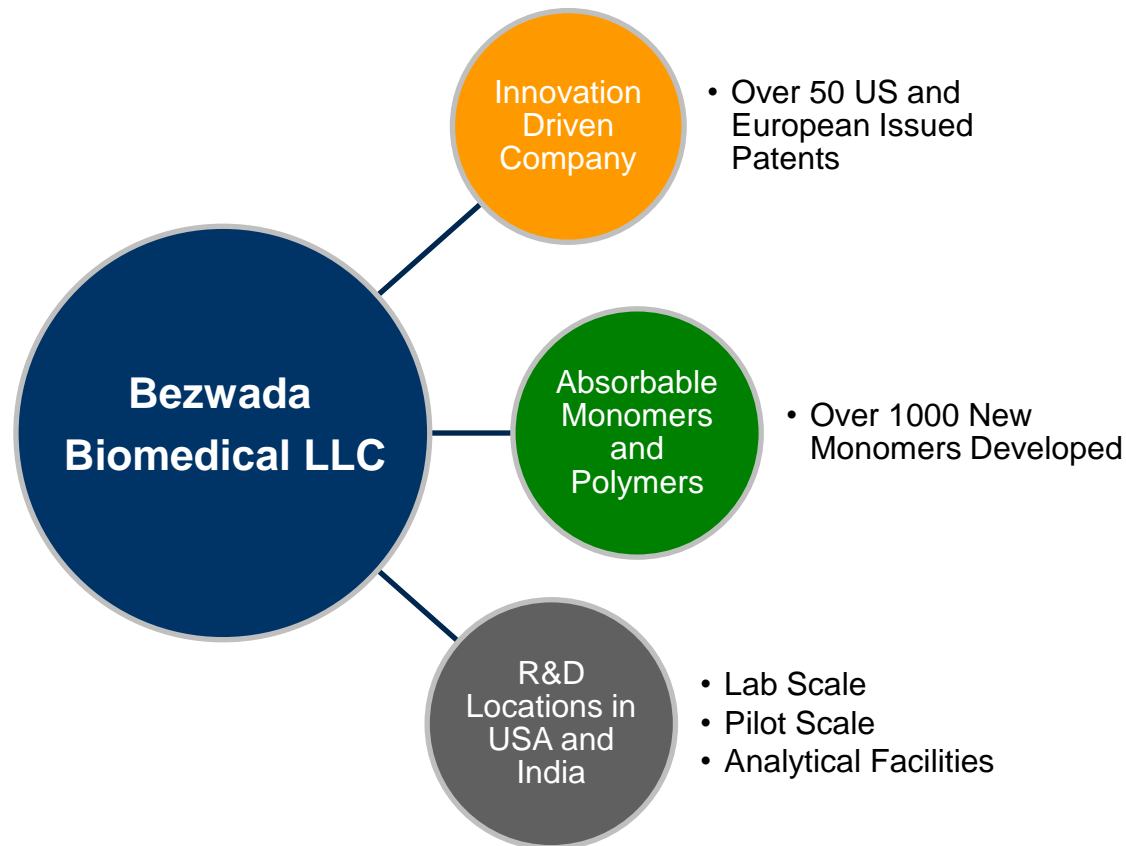


**Bezwada Biomedical, LLC**  
A Drug Device Research Company

# Corporate Overview



# Company Overview



# Examples of Applications We Make Materials for

## Tissue Engineering



## Adhesion Prevention



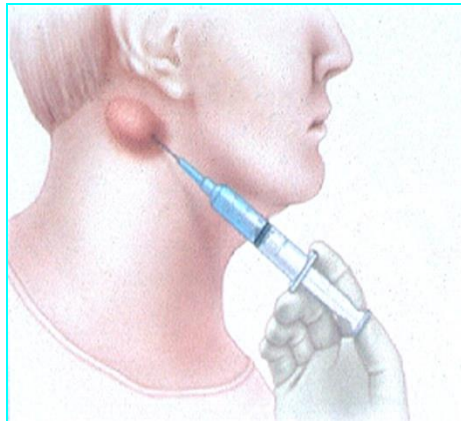
## Tissue Sealants



## Absorbable Suture



## Drug Delivery



## Stent Coatings



# Technology Platforms

## Absorbable Polyurethanes

### Key Attributes

- Derived from hydrolytically degradable isocyanates
- Tunable physical, mechanical properties and hydrolytic degradation profile
- Releases safe and biocompatible molecules upon degradation

### Applications

- Tissue Adhesive and Sealants, Wound healing, Tissue Engineering, Coatings, Drug Delivery

## Absorbable Polymers from Functionalized Drugs

### Key Attributes

- Derived from drugs and safe and biocompatible molecules
- Tunable hydrolytic degradation profile
- Releases drug molecule as such along with safe and biocompatible molecules upon degradation

### Applications

- Controlled Drug Delivery, Pain Management, Wound Healing

## Anti-Microbial

### Key Attributes

- Based on functionalized Triclosan
- Controllable release of Triclosan molecules along with safe and biocompatible molecules

### Applications

- Anti-microbial Coatings
- Anti-microbial Formulation

# Technology Platforms

## NO Releasing Drugs

### Key Attributes

- Drug molecules and NO releasing moiety attached via hydrolytically degradable linker
- Controllable release profiles

### Applications

- Treatment of Glaucoma, Osteoarthritis, Cardio-metabolic and Inflammatory Disorders
- NO Releasing Coatings

## Absorbable Polymers from Functionalized Phenolics

### Key Attributes

- Derived from natural phenolic molecules such as flavonoids, chalcones and coumarins
- Beneficial attributes of natural molecules in the polymer backbone
- Tunable hydrolytic degradation profiles

### Applications

- Drug Delivery, Cosmetics, Radiation-stable Medical Devices, Anti-microbial Coatings

## Absorbable Polymers from Functionalized Amino Acids

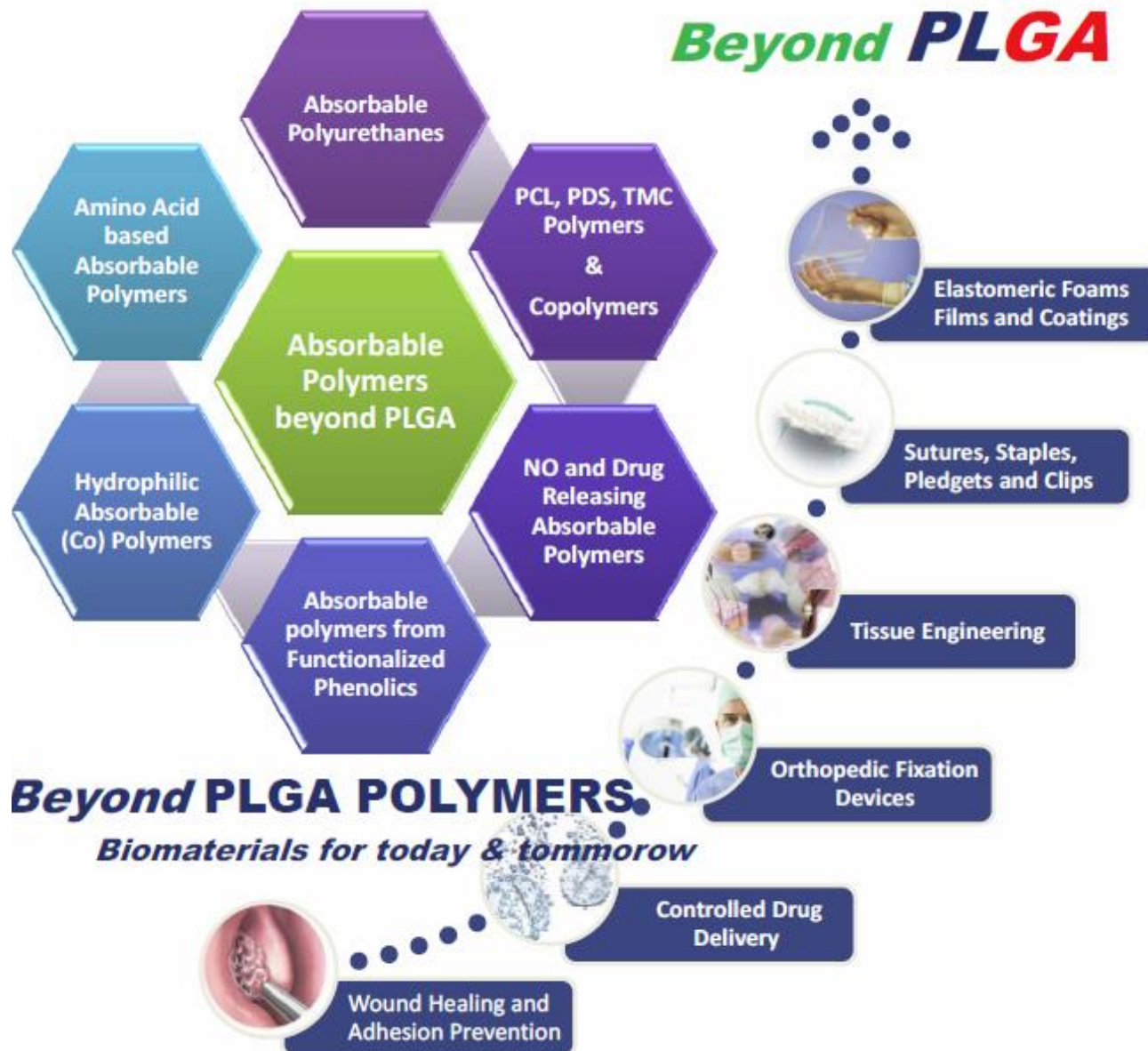
### Key Attributes

- Derived from amino acids functionalized with safe and biocompatible molecules
- Tunable physical, mechanical properties and hydrolytic degradation profile
- Releases safe and biocompatible molecules upon degradation

### Applications

- Drug Delivery, Stent and Stent Coatings, Scaffolds

# Applications for Further Product Development



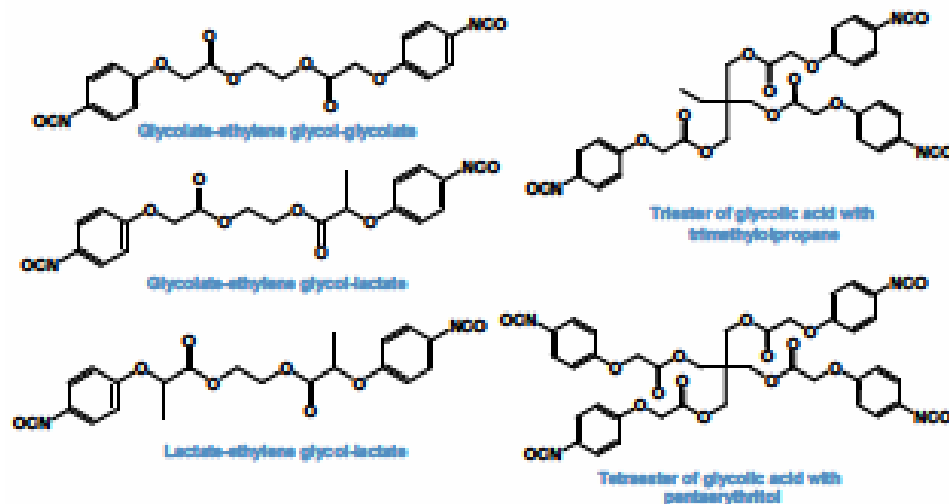


# Absorbable Polyurethanes

- Completely hydrolysable into safe and biocompatible products
- Possess for the first time hydrolysable hard segments
- Tunable physical/mechanical properties and hydrolytic degradation profiles
- Toughness and mechanical properties of that of commercially available medical grade polyurethanes, and the absorbability of commercial biodegradable polymers



## Available Hydrolysable Isocyanates



## Key Applications

- Tissue Adhesive and Sealants
- Wound healing and Adhesion prevention
- Tissue Engineering Scaffolds and Foams
- Absorbable Vascular Grafts
- Absorbable Stents/Stent Coatings
- Orthopedic Fixation devices
- Medical Device Coatings



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# Co-Developed and Commercialized Montage with Abyrx

## BASED ON BEZWADA'S ABSORBABLE POLYURETHANE TECHNOLOGY

**MONTAGE**  
SETTABLE, RESORBABLE HEMOSTATIC BONE PUTTY



***MONTAGE IS THE ONLY SETTABLE,  
RESORBABLE HEMOSTATIC BONE PUTTY***

*Adheres to bleeding bone surfaces and is  
putty-like immediately upon opening.*

*Immediately controls bleeding via mechanical  
tamponade*

*Set (harden) within minutes and fully resorb  
during the bone remodeling process.*



ABYRX



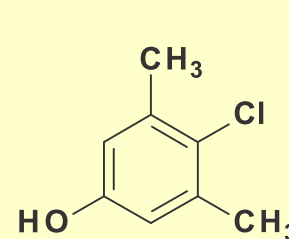
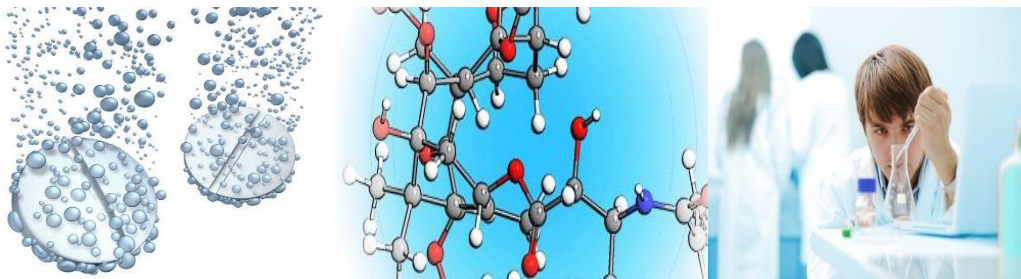
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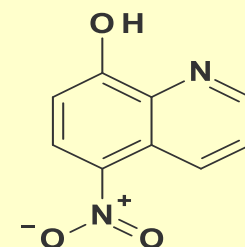
# Functionalized Antimicrobials for Control Release

Antimicrobials such as Chloroxylenol, Capsaicin, Nitroxoline and Clioquinol were functionalized with safe and biocompatible molecules such as glycolic acid, lactic acid, p-dioxanone and caprolactone.

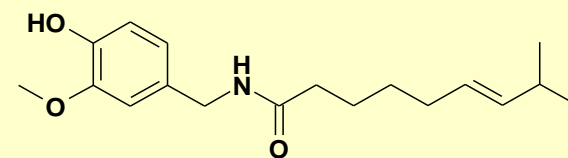
These functionalized antimicrobials can either be used as such blended with standard coating absorbable polymers (PLGA,PCL,PCL/PGA) or can be copolymerized with standard coating absorbable polymers.



**Chloroxylenol**



**Nitroxoline**



**Capsaicin**



**Clioquinol**



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# Amino Acid Polymers

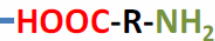
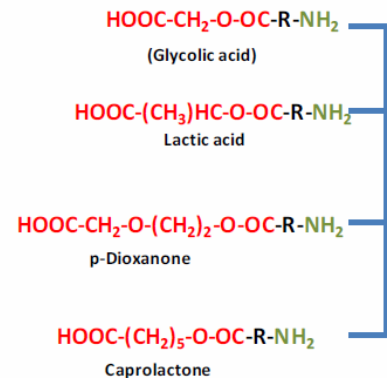
*Amino acids functionalized with safe and biocompatible molecules such as glycolic acid and lactic acid.*

- Amino acid such as tyrosine and lysine are a part of polymer backbone
- Completely hydrolysable into safe and biocompatible products and amino acids
- Tunable hydrolysis profile
- Therapeutic value of amino acid delivered at the site of action in a controlled manner
- Excellent engineering properties

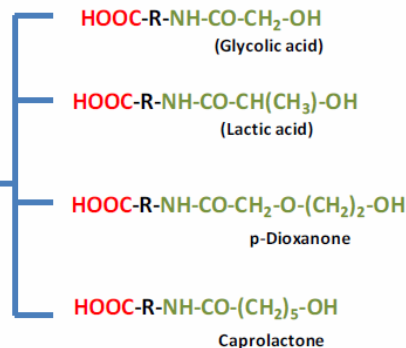
## Key Applications

- Controlled drug delivery
- Regenerative medicine
- Wound healing
- Medical device (Stent) coatings
- Adhesion prevention
- Tunable release of biologically active agents and antimicrobial compounds

### Functionalization via Esterification



### Functionalization via Amidation



Where R represents residual Aliphatic or Aromatic amino acid

# Bioconjugated Drugs for Controlled Drug Delivery

- *Drug molecule is a part of polymer backbone resulting in delivery of highly effective and potent dose*
- *Completely hydrolysable into safe and biocompatible products and drug molecule at the site of action*
- *Tunable rate of release leading to no-burst effects in delivery*
- *No need to use excipients or solubility modifiers*
- *Gamma and EtO sterilizable*



## Key Applications

*Advanced Wound Repair*

*Sports Injuries*

*Topical analgesic and anti-inflammatory creams*

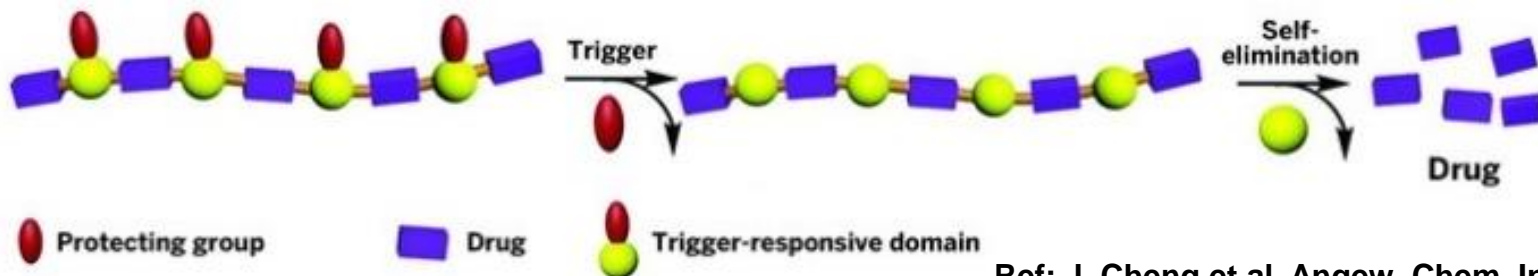
*Medical Device Coatings*

*Arthritis and Pain management*

*Veterinary applications*

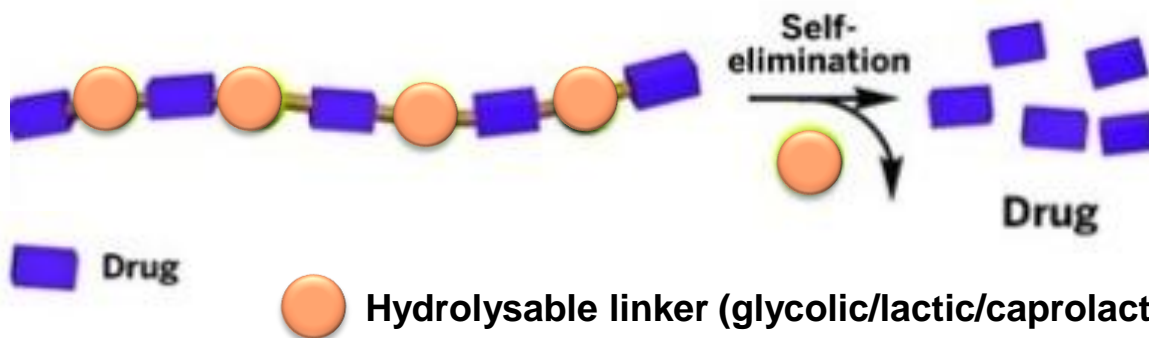
# Release of Medicines On Demand

## Drug Delivery on demand in response to a UV or Peroxide Trigger



Ref: J. Cheng et al. Angew. Chem. Int. Ed. 2013

## Bezwada Biomedical Technology

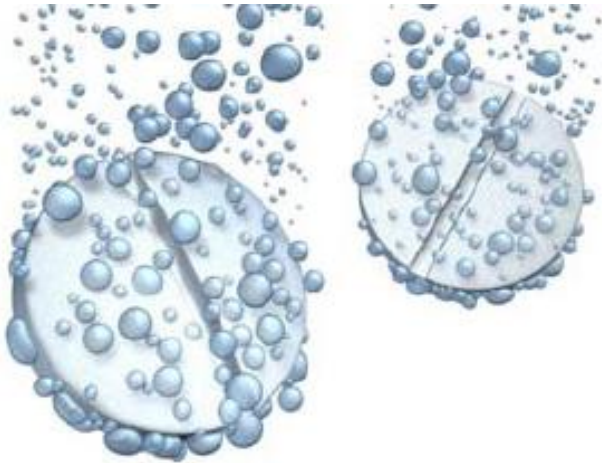


# Applications of Bioconjugated Drugs

- *Drug molecule is a part of polymer backbone resulting in delivery of highly effective and potent dose*
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## Key Applications

- Advanced Wound Repair
- Sports Injuries
- Topical analgesic and anti-inflammatory creams
- Medical Device Coatings
- Arthritis and Pain management
- Veterinary applications



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# Why Bezwada Biomedical?

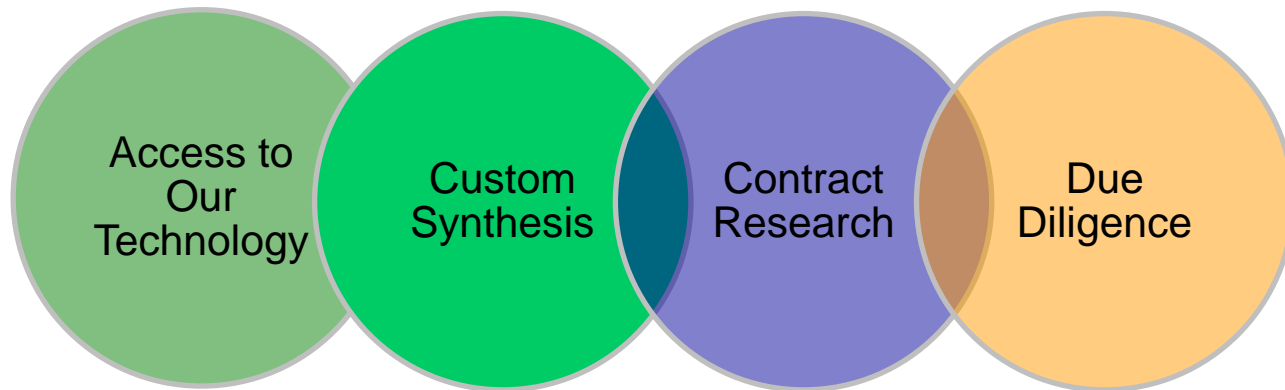
- **More than 35 years of experience in development of absorbable polymers and absorbable medical devices.**
- **Extensive infrastructure in India and accompanying expertise in the development of absorbable polymers and medical devices.**
- **Access to extensive pool of absorbable polymer based proprietary technologies under one roof, enabling the best choice for end user requirements.**
- **Providing product, process, and formulation development and characterization services to large and small medical device and pharmaceutical companies for more than 10 years.**



# What we offer

**Flexible licensing models for the validation and commercialization of our absorbable polymers for your medical application**

**Development of novel absorbable polymers according to specifications**



***Your Partner for Absorbable Polymers***

**For more information, please visit us at  
[www.bezwadabiomedical.com](http://www.bezwadabiomedical.com)**