

## **Biographical Sketch**

**Rao S Bezwada, Ph.D**

President and CEO

Bezwada Biomedical LLC

15-1 Ilene Court, Hillsborough, NJ 08844

Phone: 908-281-7529; Fax: 908-359-1179; email: [rao@bezwadabiomedical.com](mailto:rao@bezwadabiomedical.com)

### **Professional Preparation:**

Stevens Institute of Technology	Polymer Chemistry	Ph.D	1981
Stevens Institute of Technology	Chemistry	M.S	1973
University of Madras, India	Leather Technology	B.Tech	1968

### **Professional Appointments:**

- President and CEO, Bezwada Biomedical LLC (2003- Present)
- Vice President of New Business Development, INDOFINE Chemical Company (2003-Present)
- Research Fellow (1996-2003), Ethicon Inc., Somerville, NJ
- Principal Scientist (1985-1995), Ethicon, Inc., Somerville, NJ
- Senior Scientist (1982-1985), Ethicon Inc., Somerville, NJ
- Research Scientist (1981-1982), American Cyanamid, Bound Brook, NJ
- Scientist (1977-1979), American Cyanamid, Bound Brook, NJ
- Supervisor (1974-1976), American Cyanamid, Bound Brook, NJ
- Chemist (1969-1973), A.J. & J.O. Pilar, Inc., Newark, NJ

### **Honors:**

- The **Johnson Medal** for the research, development and commercialization of MONOCRYL™ Suture, 1996
- **Philip B. Hofmann Research Award** for outstanding contributions to the development of new proprietary absorbable sutures, and coatings, 1987
- American Cyanamid Junior Education Award, 1979-1981
- Kannamal Krishnaswamy Memorial Prize, 1968
- State Government Scholarship, 1964-1968
- Madras Leather Club Endowment Medal, 1968
- Gold Medal for University First Rank, University of Madras, 1968

### **Major Accomplishments:**

- Invented and applied for patents on several areas of technology platforms and some of them include (a) bioabsorbable and biocompatible polyurethanes and polyamides derived from degradable isocyanates and amines (b) absorbable polymers derived from functionalized amino acids (c) Absorbable polymers derived from functionalized phenolics (d) absorbable polymers derived from functionalized drugs (e) absorbable tissue adhesives (f) absorbable adhesion prevention barriers (g) monomers and absorbable polymers for drug delivery.
- Invented and championed a new ultra-limp synthetic absorbable suture (for Ethicon, a J & J company) known as MONOCRYL that is being sold commercially all over the world. Total worldwide sales of MONOCRYL suture since its 1993 introduction is over \$ ONE (1) Billion, and current annual sales is over \$100 million.
- Received J&J most prestigious R&D award, the **JOHNSON MEDAL**, in 1996 for the research, development and commercialization of **MONOCRYL suture**.
- More than one hundred and twenty (120) issued U.S. patents, over ten (10) pending U.S. patents and over twenty (20) published articles and over twenty five (25) presentations on polyurethane chemistry and absorbable polymers.

- Received J&J's Philip B. Hofmann Research Scientist Award in 1987 for R & D in the area of radiation sterilizable absorbable polymers, a new absorbable coating (polyglycaprone 90), and a new VICRYL-Like, monofilament.

#### **Research Interests:**

- Invent and develop new absorbable monomers and polymers for Biomedical Applications,
- Wound healing and Adhesion Prevention
- Biomaterials including Absorbable Polyurethanes
- Controlled Delivery of drugs and Nitric oxide containing therapeutic molecules
- Tissue Engineering
- Medical Device Innovation

#### **Key Patents issued to Rao S Bezwada:**

1. U S Patent No.4,228,045 Method of adhesion of rubber to reinforcing materials
2. U S Patent No.4,292,111 Method of adhesion of rubber to reinforcing materials
3. U S Patent No.4,300,973 Method of adhesion of rubber to reinforcing materials
4. U S Patent No.4,284,536 Composition for adhesion of rubber to reinforcing materials
5. U S Patent No.4,339,359 Composition for the adhesion of rubber to reinforcing materials
6. U S Patent No.4,510,295 Absorbable polymers of substituted benzoic acid
7. U S Patent No.4,523,003 Storage stable, one package, heat curable polyurea/urethane coating compositions and method of preparation
8. U S Patent No.4,546,152 Poly(p-dioxanone) polymers having improved radiation resistance
9. U S Patent No.4,532,928 Surgical sutures made from absorbable polymers of substituted benzoic acid
10. U S Patent No.4,643,191 Crystalline copolymers of p-dioxanone and lactide and surgical devices made therefrom
11. U S Patent No.4,649,921 Poly(p-dioxanone) polymers having improved radiation resistance
12. U S Patent No.4,653,497 Crystalline p-dioxanone/glycolide copolymers and surgical devices made therefrom
13. U S Patent No.4,838,267 Glycolide/p-dioxanone block copolymers
14. U S Patent No.4,994,074 Copolymers of e-caprolactone, glycolide and glycolic acid for suture coatings
15. U S Patent No.5,007,923 Crystalline copolyesters of amorphous (lactide/glycolide) and p-dioxanone
16. U S Patent No.5,019,094 Crystalline copolymers of p-dioxanone and poly (alkylene oxides)
17. U S Patent No.5,047,048 Crystalline copolymers of p-dioxanone and e-caprolactone
18. U S Patent No.5,037,950 Bioabsorbable copolymers of polyalkylene carbonate/RHO-dioxanone for sutures and coatings
19. U S Patent No.5,076,807 Random copolymers of p-dioxanone, lactide and/or glycolide as coating polymers for surgical filaments
20. U S Patent No.5,089,013 Suture coated with a polyvinyl ester
21. U S Patent No.5,100,433 Suture coated with a copolymer coating composition
22. U S Patent No.5,133,739 Segmented copolymers of e-caprolactone and glycolide
23. U S Patent No.5,147,383 Suture coated with a polyvinyl ester
24. U S Patent No.5,371,176 Castor oil polymers
25. U S Patent No.5,411,554 Liquid polymer filled envelopes for use as surgical implants
26. U S Patent No.5,468,253 Elastomeric medical device
27. U S Patent No.5,442,032 Copolymers of 1,4-dioxepan-2-one and 1,5,8,12- tetraoxacyclotetradecane-7-14-dione
28. U S Patent No.5,442,033 Liquid copolymers of epsilon-caprolactone and lactide
29. U S Patent No.5,470,340 Copolymers of (p-dioxanone/glycolide and/or lactide) and p-dioxanone
30. U S Patent No.5,464,929 Absorbable polyoxaesters
31. U S Patent No.5,427,778 Gel formulations containing growth factors and acrylamide polymer
32. U S Patent No.5,595,751 Absorbable polyoxaesters containing amines and/or amido groups
33. U S Patent No.5,597,579 Blends of absorbable polyoxaamides
34. U S Patent No.5,599,852 Injectable microdispersions for soft tissue repair and augmentation
35. U S Patent No.5,607,687 Polymer blends containing absorbable polyoxaesters

36. U S Patent No.5,620,698 Blends of absorbable polyoxaesters containing amines and/or amido groups
37. U S Patent No.5,618,552 Absorbable polyoxaesters
38. U S Patent No.5,631,015 Liquid absorbable copolymers for parenteral applications
39. U S Patent No.5,639,851 High strength, melt processable, lactide-rich, poly (lactide-co-p-dioxanone) copolymers
40. U S Patent No.5,674,921 Radiation-curable, urethane-acrylate prepolymers and crosslinked polymers
41. U S Patent No.5,633,343 High strength, fast absorbing, melt processable, glycolide-rich, poly (glycolide-co-p-dioxanone) copolymers
42. U S Patent No.5,645,850 Blending containing absorbable polyoxaamides
43. U S Patent No.5,648,088 Blends of absorbable polyoxaesters containing amines and/or amide groups
44. U S Patent No.5,653,992 Liquid absorbable copolymers for parenteral applications
45. U S Patent No.5,698,213 Hydrogels of absorbable polyoxaesters
46. U S Patent No.5,700,583 Hydrogels of absorbable polyoxaesters containing amines or amido groups
47. U S Patent No.5,703,200 Absorbable copolymers and blends of 6,6-dialkyl-1,4-dioxepan-2-one and its cyclic dimer
48. U S Patent No.5,713,920 Elastomeric medical device
49. U S Patent No.5,714,551 High strength, melt processable, lactide-rich, poly (lactide-co-p-dioxanone) copolymers
50. U S Patent No.5,728,752 Injectable microdispersions for soft tissue repair and augmentation
51. U S Patent No.5,824,333 Injectable liquid copolymers for soft tissue repair and augmentation
52. U S Patent No.5,859,150 Prepolymers of absorbable polyoxaesters
53. U S Patent No.5,868,788 High-strength, melt-processable, lactade-rich, poly(lactade-co-p-dioxanone) copolymers
54. U S Patent No.5,844,017 Prepolymers of absorbable polyoxaesters containing amines and/or amido groups
55. U S Patent No.5,951,997 Aliphatic polyesters of  $\epsilon$ -caprolactone, p-dioxanone and glycolide
56. U S Patent No.5,962,023 Hydrogels containing absorbable polyoxaamides
57. U S Patent No.6,031,018 Solventless tipping of braided surgical ligature
58. U S Patent No.6,074,660 Absorbable polyoxaesters containing amines and/or amido groups
59. U S Patent No.6,100,346 Copolymers of polyoxaamides
60. U S Patent No.6,147,168 Copolymers of absorbable polyoxaesters
61. U S Patent No.6,116,324 Absorbable elastomeric polymer
62. U S Patent No.6,224,894 Copolymers of absorbable polyoxaesters
63. U S Patent No 6,251,435 Hydrogels containing absorbable polyoxaamides
64. U S Patent No.6,325,810 Foam buttress for stapling apparatus
65. U S Patent No.6,335,383 Microdispersions for coating surgical devices
66. U S Patent No.6,372,256 Hydrogels containing absorbable polyoxaamides
67. U S Patent No.6,403,655 Method of preventing adhesions with absorbable polyoxaesters
68. U S Patent No.6,458,385 Hydrogels containing absorbable polyoxaamides
69. U S Patent No.6,712,838 Braided suture with improved knot strength and process to produce same
70. U S Patent No.6,794,484 Crystallizable polylactone copolymers prepared from mono-and di-functional polymerization initiators
71. U S Patent No.6,831,149 Polymerization process using mono-and di-functional initiators to prepare fast crystallizing polyactone copolymers
72. U S Patent No.6,932,974 Method of preventing adhesions with absorbable polyoxaesters
73. U S Patent No.7,671,168 Unsymmetrical aromatic ether diacids and absorbable polymers therefrom
74. U S Patent No.7,691,364 Functionalized drugs and polymers derived therefrom
75. U S Patent No.7,754,233 Method of preventing post-operative surgical adhesion
76. U S Patent No.7,772,352 Bioabsorbable and biocompatible polyurethanes and polyamides for medical devices
77. U S Patent No.7,85,8077 Functionalized phenolic esters and amides and polymers therefrom
78. U S Patent No.7,935,843 Functionalized diphenolics and absorbable polymers therefrom
79. U S Patent No.7,902,319 Unsymmetrical aromatic ether diacids and absorbable polymers therefrom
80. U S Patent No.8,007,526 Difunctionalized aromatic compounds and polymers therefrom
81. U S Patent No.8,026,285 Control release of biologically active compounds from multi-armed oligomers
82. U S Patent No.8,053,591 Functionalized biodegradable triclosan monomers and oligomers for controlled release

83. U S Patent No.8,062,653 Controlled release of nitric oxide and drugs from functionalized macromers and oligomers
84. U S Patent No.8,048,980 Hydrolysable linkers and cross-linkers for absorbable polymers
85. U S Patent No.8,093,420 Functionalized amino acids and absorbable polymers therefrom
86. U S Patent No.8,143,325 Bioabsorbable and biocompatible polyurethanes and polyamides for medical devices
87. U S Patent No.8,163,806 Controlled release of biologically active compounds from multiarmed oligomers
88. U S Patent No.8,217,134 Controlled release of biologically active compounds
89. U S Patent No.8,232,422 Functionalized biodegradable triclosan monomers and oligomers for controlled release
90. U S Patent No.8,288,505 Functionalized diphenolics and absorbable polymers therefrom
91. U S Patent No.8,303,978 Controlled release of nitric oxide and drugs from functionalized macromers and oligomers
92. U S Patent No.8,309,132 Bioabsorbable polyesteramides and uses thereof
93. U S Patent No.8,309,754 Functionalized amino acids and absorbable polymers therefrom
94. U S Patent No.8,318,973 Functionalized sinapic acid and methyl sinapate
95. U S Patent No.8,367,108 Functionalized non-phenolic amino acids and absorbable polymers therefrom
96. U S Patent No.8,367,747 Bioabsorbable polymers from bioabsorbable polyisocyanates and uses thereof
97. U S Patent No.8,372,882 Functionalized phenolic esters and amides and polymers therefrom
98. U S Patent No.8,399,696 Functionalized biodegradable triclosan monomers and oligomers for controlled release
99. U S Patent No.8,409,559 Functionalized drugs and polymers derived therefrom
100. U S Patent No.8,436,201 Functionalized diphenolics and absorbable polymers therefrom
101. U S Patent No.8,461,372 Amino acid derivatives and absorbable polymers therefrom
102. U S Patent No.8,519,156 Functionalized non-phenolic amino acids and absorbable polymers therefrom
103. U S Patent No.8,519,175 Functionalized amino acids and absorbable polymers therefrom
104. U S Patent No.8,552,139 Controlled release of biologically active compounds
105. U S Patent No.8,551,519 Bioabsorbable surgical articles or components thereof
106. U S Patent No.8,664,429 B2 Hydrolysable linkers and cross-linkers for absorbable polymers
107. U S Patent No.8,664,426B2 Functionalized amino acids and absorbable polymers therefrom
108. U S Patent No.8,754,135 Functionalized non-phenolic amino acids and absorbable polymers therefrom
109. U S Patent No. 8,802,147 Control release of biologically active compounds
110. U S Patent No. 8,802,892 Functionalized phenolic compounds and polymers therefrom
111. U S Patent No. 8,846,845 Bioabsorbable and biocompatible polyurethanes and polyamides for medical devices
112. U S Patent No. 8,901,341 Amino acid derivatives and absorbable polymers therefrom
113. U S Patent No. 8,901,347 Absorbable polyurethanes and methods of use thereof
114. U S Patent No. 9,012,677 Amino acid derivatives and absorbable polymers therefrom
115. U S Patent No. 9,045,396 Hydrolysable linkers and cross-linkers for absorbable polymers
116. U S Patent No. RE45,548 Functionalized drugs and polymers derived therefrom
117. U S Patent No. 9,174,924 Hydrolysable linkers and cross-linkers for absorbable polymers
118. U S Patent No. 9,301,752 Tissue thickness compensator comprising a plurality of capsules
119. U S Patent No. 9,307,989 Tissue stapler having a thickness compensator incorporating a hydrophobic agent
120. U S Patent No. 9,314,247 Tissue stapler having a thickness compensator incorporating a hydrophilic agent
121. U S Patent No. 9,314,547 Absorbable multi-putty bone cements and hemostatic compositions and methods of use
122. U S Patent No. 9,328,192 Bio-based monomers and polymers

#### **Book Chapters and Selected Publications:**

1. **Rao S. Bezwada**, Dennis D. Jamiolkowski and Kevin Cooper "Poly(p-Dioxanone) and its Copolymers" in Handbook of Biodegradable Polymer, Harwood Academic Publishers, Australia, 1997, Abraham J. Domb, Joseph Kost, David M. Wiseman, eds., Chapter 2, pages 29-61.
2. Dennis D. Jamiolkowski, **Rao S. Bezwada**, and Shalaby W. Shalaby "Copolymerization of Glycolide with Polymeric Radiostabilizers for the Preparation of Radiation Sterilizable Braided Sutures", in Irradiation of Polymeric Materials;

Process, Mechanisms, and Applications, ACS Symposium Series No. 527; American Chemical Society, Washington DC, 1993; Chapter 21.

3. **Rao S. Bezwada** "Nitric Oxide and Drug Releasing Hydrolysable Macromers, Oligomers and Polymers", ACS Symposium Series No. 1054; American Chemical Society, Washington DC, 2010; Chapter 11.
4. **Rao S. Bezwada** "Absorbable Polyurethanes", ACS Symposium Series No. 1054; American Chemical Society, Washington DC, 2010; Chapter 7.
5. **Rao S Bezwada** Synthesis and Characterization of Absorbable Polyurethanes from Novel Isocyanates, Polymeric Materials Science & Engineering preprints 2006, 95, 1054
6. **Rao S Bezwada** Novel Degradable Polyurethane Tissue Adhesives, Transactions of the Society for Biomaterials, 2008, Abstract Number 70.
7. **Rao S Bezwada**, "Monocryl Suture, a new ultra-pliable absorbable monofilament suture", Biomaterials, 1995, 16 (15), 1141-8.
8. **Rao S Bezwada**, "Absorbable Stent Coatings from functionalized drugs to prevent restenosis and late thrombosis", Polymeric Materials Science & Engineering preprints 2006, 95, 401