

Thomas D Reed, PhD

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Summary

Dr. Reed was the Founder and Chief Science Officer of Intrexon and the Co-Founder of Precigen Triple-Gene. He founded BioSolution Designs in April 2020, an IP holding company focused on high value biotech products to address major unmet needs.

During his 20+ year tenure at Intrexon, Dr. Reed invented numerous technologies that improve the safety and efficacy of gene and cell therapies. He gained multidisciplinary expertise that enabled acquisition of advanced technologies to complement Intrexon's in-house portfolio and contributed to the growth of commercial operations and business development, including strategic ventures in health, food, environment and consumer sectors.

Dr. Reed designed the genetic platform along with its application for designing therapeutic candidates for oncology, cardiovascular, and rare disease treatments now advancing in the clinic. Prior to founding Intrexon, Dr. Reed's scientific training focused on characterizing the structure and function of genes critical for cardiovascular development and pathophysiology.

Education:

Ph.D., Molecular and Developmental Biology
University of Cincinnati (1999)

M.S., Biological Sciences
Wright State University (1991)

B.S., Genetics
University of California, Davis (1989)

Experience:

Founder & President (2020-Present)

BioSolution Designs, LLC
Boynton Beach, FL
www.biodzn.com

BSD's core mission links intellectual property with the scientific and business perspectives required for new product development integrating bioinformation systems, biomaterials, and device engineering. Employing these synergistic areas of expertise, the BSD team focuses on inventing complex, novel products to meet long-standing market needs.

Founder & Chief Science Officer (1998 – 2020)

Intrexon Corporation (*renamed Precigen in 2020*)

Germantown, MD

www.precigen.com | Public NASDAQ: PGEN

Intrexon focused on bioengineering solutions for health, food, energy, environment and consumer sectors with numerous first-in-class products trailblazing regulatory paths to market. In 2020, Intrexon changed its name to Precigen, Inc. (NASDAQ: PGEN) to reflect its refocused effort on precision medicine-based immunotherapies employing a diverse spectrum of therapeutic modalities, including gene and cell therapies and engineered probiotics.

Highlights & Accomplishments

- Initiated and Co-led early development of the UltraPorator[®] gene delivery system approved by FDA for use in autologous chimeric antigen receptor T cell (UltraCAR-T[®]) clinical trials (2016-2019).
- Acquired Genomatix, GmbH to further enhance DNA design and bioinformatics capabilities. (2018). Co-managed corporate and platform integration. (2018-19)
- Acquired GenVec, Inc., a company focused on developing adenoviral-based gene therapies and vaccines. (2017) Co-managed corporate and platform integration. (2018)
- Co-founded Xogenex (now Triple-Gene LLC), a gene therapy company focused on developing advanced therapies for complex cardiovascular diseases. (2014) Managed clinical and business operations. (2018-20)
- Led Consumer Sector, including launch of US-based ViaGen Pet Services (2014-15)
- Co-led design of therapeutic candidates for treating Friedrich's Ataxia, enabling formation and Exclusive Channel Collaboration with Agilis Biotherapeutics (2013)
- Led scientific communications critical for completion of Intrexon's initial public offering (\$168.3 million) to drive development of programs addressing bioengineering technology opportunities in health, food, energy, environment, and consumer sectors (2013)
- Co-led design of chimeric antigen receptor T cell (UltraCAR-T[®]) therapy product development strategy, including invention, acquisition, and optimization of systems required for scalable decentralization of autologous GM-T Cell production (2012-19)
- Advanced genetically-modified (GM) autologous fibroblast drug development strategy enabling Exclusive Channel Collaboration with Fibrocell Science, Inc., including foundational designs for FCX-007, an autologous GM-Cell therapy for treating Recessive Dystrophic Epidermolysis Bullosa (RDEB) (2012)
- Acquired and integrated Cytellect and GT Life Sciences to form Cell Engineering Unit (2011); managed operations (2011-13)
- Co-led acquisition of Agarigen core technologies and formation of AgBio operating division and

strategic business sector (2011)

- Advanced drug development strategy for Modular Inducible Cancer Immunotherapy (MICI) enabling Exclusive Channel Collaboration with Ziopharm Oncology (2011)
- Secured \$100M Series E Round. Managed technical strategy and diligence components. (2011)
- Led Molecular Engineering Research Unit (2009-13) and Corporate Technology Analysis Unit (2009-19)
- Co-led preparation and filing of the Phase 1b, Open Label Trial to Evaluate the Safety, Tolerance, Transgene Function, and Immunological Effects of an Intratumoral Injection of Adenoviral Transduced Autologous Dendritic Cells Engineered to Express hIL-12 in Subjects With Stage III or IV Melanoma (2008)
- Co-led preparation, filing, and clinical management of the Phase 1a Study testing safety of the RheoSwitch[®] Activator Ligand RG-115932 (2008)
- Expanded research and development divisions to ~90 scientists and engineers at VA and PA sites to support UltraVector manufacturing division. Managed integration of multidisciplinary teams including DNA/RNA/protein design teams, as well as chemistry, cell biology, viral production, and software development teams. (2007-09)
- Raised a \$25M Series C-2 Round (Third Security, LLC) to focus on accelerating translation of the RheoSwitch[®] system into human clinical trials and expand library of therapeutic modulators (2007)
- Acquired RheoGene. Integrated core technologies to deliver gene therapies focused on immunoncology. (2007)
- Raised \$5M Series C Round (Third Security, LLC). Transitioned Intrexon from a research tools and transgene services provider to developer of human therapeutics focused on subcellular modulation of phosphorylation dynamics. (2006)
- Expanded sales and operations with follow-on \$1M Series B-2 Round raise (NewVa Capital Partners) (2006)
- Raised a \$500K Series B-1 Round, changed name from Genomatix to Intrexon Corporation (NewVa Capital Partners) (2005)
- Formed strategic partnership with RheoGene for RheoSwitch[®] molecular tools to control gene expression and synergize with the SubExplorer platform (2005)
- Launched cell signaling research tools platform (SubExplorer) to measure phosphorylation dynamics in subcellular compartments (2004)
- Executed ~\$1M Series A raise for transgene manufacturing expansion and corporate relocation from Cincinnati to the Virginia Tech Corporate Research Center (2004)
- Established independent commercial laboratory in Hamilton County Business Center with ~\$300K raised funds (2000)
- Performed on-site transgene construction services for Greater Cincinnati Area research labs (1999)
- Founded startup Genomatix LLC during graduate studies at University of Cincinnati (1998)

Patents

Granted Patents and Active Patent Applications

Modulating Expression of Polypeptides via New Gene Switch Expression Systems. WO2018132494 filed in 2018 with priority date 2017. Pending in US.

Exosome Delivery of Skin Care Peptides. WO2020018926 filed in 2019 with priority to 2018.

Methods for Dynamic Vector Assembly of DNA Cloning Vector Plasmids. Granted in US as US9115361 and US10036026.

DNA Cloning Vector Plasmids and Methods for Their Use. Parent application filed in US in 2003; granted as US7785871.

Therapeutic Gene-Switch Constructs and Bioreactors for the Expression of Biotherapeutic Molecules and Uses Thereof. Granted in the US as US9724430 and US10314926.

Methods and Compositions for Diagnosing Disease. Granted in US as US9222121 and US9605316.

Synthetic 5'UTRs, Expression Vectors and Methods for Increasing Transgene Expression. Parent application filed in US in 2010; granted as US8835621.

Tubulo-Vesicular Structure Localization Signals. Granted in US as US8993742.

Endoplasmic Reticulum Localization Signals. Parent application filed in US in 2007; granted as US7897394.

Signal for Targeting Molecules to the Sarco(endoplasmic Reticulum). Filed in US in 2003, granted as US7071295.

Therapeutic Inhibitors of PAI-1 Function and Methods of Their Use. Parent application filed in 2010 and granted in US as US8431363.

PP1 Ligands. Granted in US as US8455628.

MEK Ligands and Polynucleotides Encoding MEK Ligands. Granted in US as US8575304 and US9006390.

mTOR Ligands and Polynucleotides Encoding mTOR Ligands. Parent application filed in US in 2007; granted as US7705122.

Extracellular-Signal-Regulated-Kinase (ERK) Heteropolyligand Polypeptide. Granted in US as US8283445.

Glycogen Synthase Kinase Heteropolyligand Polypeptide. Granted in US as US8729225.

PKC Ligands and Polynucleotides Encoding PKC Ligands. Granted in US as US8999666.

PKA Ligands and Polynucleotides Encoding PKA Ligands. Granted in US as US8993263.

AKT Ligands and Polynucleotides Encoding AKT Ligands. Parent application filed in US in 2007; granted as US7943732.

Methods of Making Modular Fusion Protein Expression Products. Granted in US as US8603807.

PKD Ligands and Polynucleotides Encoding PKD. Granted in US as US8153598 and US8993531.

Engineered Cells Expressing Multiple Immunomodulators and Uses Thereof. Parent application filed in US in 2011; granted as US9492482 and US10046049.

Casting Apparatus for Electrophoretic Gel Tray. Granted in 2004 as US6769664

Presentations

Triple-Gene (formerly Xogenex) presents interim clinical data for INXN-4001 Triple Effector Cardiac Gene Therapy. Thomas Reed. 12th Annual Biotech Showcase 2020 organized by EDB Group, San Francisco CA

Xogenex INXN-4001 Triple Effector Cardiac Gene Therapy. Amit Patel and Thomas Reed. 11th Annual Biotech Showcase 2019 organized by EDB Group, San Francisco CA . (January XX, 2019)

Invited panelist for Council on Competitiveness Briefing to accompany release of “**Report on Future of Bioscience and Manufacturing**”; Washington DC. (July 25, 2017)

Invited presenter and panelist for **National Academies of Sciences, Engineering, and Medicine Committee on Future Biotechnology Products and Opportunities to Enhance Capabilities of the Biotechnology Regulatory System**; Washington DC. (April 21, 2016)

Invited panelist for the **National Academies of Sciences, Engineering, and Medicine Workshop on “The Disruption Myth and Gaps in the Innovation Ecosystem”**; Washington DC. (October 20, 2015)

Invited speaker for **ZIOPHARM Oncology Analyst & Institutional Investor Meeting.** NASDAQ Auditorium, New York City, New York. (June 23, 2011)

Publications

Generation of Mice with a Conditional Allele for the Transforming Growth Factor Beta3 Gene. Thomas Doetschman, Teodora Georgieva, Hongqi Li, Thomas D. Reed, Christina Grisham, Jacqueline Friel, Mark A. Estabrook, Connie Gard, L.P. Sanford, and Mohamad Azhar. *Genesis*. 2012 January; 50(1):59-66.

ERK Regulates Strain-Induced Migration and Proliferation from Different Subcellular Locations. Gayer CP, Craig DH, Flanagan TL, **Reed TD**, Cress DE, Basson MD. [Journal of Cellular Biochemistry. \(2010\) March; 109\(4\):711-25.](#)

Outsourcing Molecular Biology Tasks: A Valuable Business Tool for Accelerating Bioprocessing R&D. Thomas D. Reed. *BioContract Services* (2004) 1:S25-S30.

Targeted Inhibition of Ca²⁺/Calmodulin Dependent Protein Kinase II in Cardiac Longitudinal Sarcoplasmic Reticulum Results in Decreased Phospholamban Phosphorylation at Threonine-17. Ji Yong, Bailing Li, Thomas Reed, John Lorenz and John Dedman. *Journal of Biological Chemistry* [\(2003\) 278:25063-71.](#)

Replacement of the Muscle-Specific Sarcoplasmic Reticulum Ca(2+)-ATPase Isoform SERCA2a by the Nonmuscle SERCA2b Homologue Causes Mild Concentric Hypertrophy and Impairs Contraction-Relaxation of the Heart. Ver Heyen M, Heymans S, Antoons G, **Reed T**, Periasamy M, Awede B, Lebacqz J, Vangheluwe P, Dewechin M, Collen deS, Sipido K, Carmeliet P, Wuytack F. *Circulation Research* [\(2001\) 89:838-46.](#)

Changes in Ionic Currents and Beta-Adrenergic Receptor Signaling in Hypertrophied Myocytes Overexpressing Galphaq. Mitari S, Reed TD and Yatani A. *American Journal of Physiology* [\(2000\) 279:H139-48.](#)

The Expression of SR Calcium ATPase and the Na⁺/Ca²⁺ Exchanger are Antithetically Regulated during Mouse Cardiac Development and in Hypo/Hyperthyroidism. Reed TD, Babu GJ, Ji Y, Zilberman A, Ver Heyen M, Wuytack F, Periasamy M. *Journal of Molecular and Cellular Cardiology* (2000) 32:453-64.

Structure and Organization of the Mouse ATP2A2 Gene Encoding the Sarco(endo)-plasmic Reticulum Ca²⁺-ATPase 2 (SERCA2) Isoforms. Ver Heyen M and Reed TD (co-first authors), Blough RI, Baker DL, Zilberman A, Loukianov E, Van Baelen K, Raeymaekers, L, Periasamy M and Wuytack F. *Mammalian Genome* (2000) 11:159-63.

Impaired Cardiac Performance in Heterozygous Mice with a Null Mutation in Sarco(endo)plasmic Reticulum Ca²⁺-ATPase Isoform 2 (SERCA2) Gene. Periasamy M, Reed TD, Liu LH, Ji Y, Loukianov E, Paul RI, Nieman ML, Miller ML, Riddle T, Duffy JJ, Doetschman, T, Lorenz JN and Shull GE. *Journal of Biological Chemistry* (1999) 274:2556-62.

Targeted Overexpression of the Sarcoplasmic Reticulum Ca²⁺-ATPase Increases Cardiac Contractility in Transgenic Mouse Hearts. Baker DL, Hashimoto K, Grupp IL, Ji Y, Reed T, Loukianov E, Grupp G, Bhagwat A, Hoit B, Walsh R, Marban E and Periasamy M. *Circulation Research* (1998) 83:1205-14.

Sarco(endo)plasmic Reticulum Ca²⁺ ATPase Isoforms and Their Role in Muscle Physiology and Pathology. Loukianov E, Ji Y, Baker DL, Reed T, Babu J, Loukianov T, Greene A, Shull G and Periasamy M. *Annals of the New York Academy of Sciences* (1998) 853:251-59.

A Novel E Box/AT-Rich Element is Required for Muscle-Specific Expression of the Sarcoplasmic Reticulum Ca²⁺-ATPase (SERCA2) Gene. Baker DL, Dave V, Reed T, Misra S and Periasamy M. *Nucleic Acids Research* (1998) 26:1092-98.

Multiple Sp1 Binding Sites in the Cardiac/Slow Twitch Muscle Sarcoplasmic Reticulum Ca²⁺-ATPase Gene Promoter are Required for Expression in Sol8 Muscle Cells. Baker D, Dave V, Reed T and Periasamy M. *Journal of Biological Chemistry* (1996) 271:5921-28.

Characterization of the Mouse Cardiac/Slow-Twitch Muscle-Enhanced Sarco(endo)plasmic Reticulum Calcium ATPase (SERCA2) Gene. Thomas D. Reed. Doctor of Philosophy Dissertation (1998) University of Cincinnati College of Medicine; Cincinnati, Ohio.

A GTP-binding Activity from Bovine Heart Affects Phosphoinositide-Specific Phospholipase C (PIC) Activity. Thomas D. Reed. Master of Science Thesis (1991) Wright State University; Dayton, Ohio.

Posters

Safety of First-in-Human Triple Gene Therapy for Heart Failure Patients. Ewa Jaruga-Killeen, David Bull, Kapildeo Lotun, Timothy Henry, Gregory Egnaczyk, **Thomas Reed**, Amit Patel. American Heart Association, Scientific Sessions 2019

Human Cardiac iPSC Evaluation of Novel Triple Effector Gene Therapy for Dilated Cardiomyopathy. Dimki Patel, Joseph Wu, **Thomas Reed**, Amit Patel. American Society of Gene and Cell Therapy, Annual Meeting 2019

Minimally Invasive Novel Triple Effector Gene Therapy for Adriamycin Cardiomyopathy. Paul Grayburn, Dimki Patel, Shuyuan Chen, **Thomas Reed**, Amit Patel. American Society of Gene and Cell Therapy, Annual Meeting 2019

Retrograde Delivery of Novel Triple Effector pDNA Gene Therapy for Heart Failure. Thomas Reed, Dimki Patel, Eric Rodenberg, Brad Shirley, Mark Johnson, Amit Patel. American Society of Gene and Cell Therapy, Annual Meeting 2019

First Human Experience with Novel Triple Effector Gene Therapy for Heart Failure - INXN-4001. Thomas Reed, Amy Lankford, David Bull, Ewa Jaruga-Killeen, Amit Patel. American Society of Gene and Cell Therapy, Annual Meeting 2019

Ad-RTS-hIL-12 + Veledimex Regulation of IL-12 Expression in Advanced Breast Cancer and Melanoma. John Nemunaitis, Gerald Linette, Haythem Ali, Troy Guthrie, Francois Lebel, John Barrett, Thomas Reed, Suma Krishnan, Jonathan Lewis, Larry Norton. AACR Tumor Immunology 2014

Regulated intratumoral expression of IL-12 in combination with cytotoxic agents as a strategy for the treatment of metastatic breast cancer. John Nemunaitis, Heather McArthur, Clifford Hudis, Thomas Reed, Samuel Broder, Francois Lebel, John Barrett, Jonathan Lewis, Larry Norton. San Antonio Breast Cancer Symposium 2013

A Phase I Open-Label Study of Ad-RTS-hIL-12, an Adenoviral Vector Engineered to Express hIL-12, in Combination with an Oral Activator Ligand in Subjects with Unresectable Stage III/IV Melanoma. G.P. Linette, O. Hamid, E.D. Whitman, J.J. Nemunaitis, J. Chesney, S.S. Agarwala, A. Starodub, J.A. Barrett, A. Marsh, L. Martell, A. Cho, T.D. Reed, H. Youssoufian, A. Vergara Silva. American Society of Clinical Oncology Annual Meeting 2013

Pharmacodynamics and Functionality of RheoSwitch® Regulated Immunostimulatory and Immunomodulatory Proteins, Expressed from a Multigenic Embedded Cellular Bioreactor following Intramuscular Electroporation in Mice. Pooja Agarwal, Stephen Schauer, Xiaohong Ma, Jacques Plummer, Tim Chan, Lindsay Williams, M. Kaloss, John Barrett, R. Einstein, Laurent Humeau and Thomas Reed. AACR-NCI-EORTC International Conference on Molecular Targets and Cancer Therapeutics 2013

Integration of a Modularized Protein Engineering Technology and the RheoSwitch Therapeutic System® (RTS®) Platform to Develop High Affinity Trastuzumab Single Chain Variable Fragment-Fc Proteins for Gene Therapy Applications. C. Reed, V. Dailey, A. Elayadi, L. Williams, D. Schneider, T. Reed, J. Lewis, R. Einstein and S. Broder. AACR-NCI-EORTC International Conference on Molecular Targets and Cancer Therapeutics 2013

Regulated Immunomodulators Expression Using the RheoSwitch Therapeutic System® Platform in Human Mesenchymal Stem Cells. T. Chan, A. Prabhu, A. Elayadi, L. Williams, V. Dailey, K. Elliot, T.S Snipas, J. Carson, J. Lewis, S. Schauer, R. Einstein, J. Rieger, L Humeau and T. Reed. AACR-NCI-EORTC International Conference on Molecular Targets and Cancer Therapeutics 2013

Community and Public Service

- **U.S. Council on Competitiveness Technology Leadership & Strategy Initiative Committee (2016-19).** The TLSI is a cross-sectoral, results-driven “action tank” making the business case for strategic, prioritized investments in the research, talent and infrastructure necessary for tech-based innovation; chaired by Boeing Chief Technology Officer Greg Hyslop, Lockheed Martin CTO Keoki Jackson and Deere & Company VP for Advanced Technology & Engineering Klaus Hoehn and comprising a peer group of CTOs, CSOs and heads of research at leading companies, universities and national laboratories.

- **Wright State University Contributor**

- Co-sponsored development of the College of Liberal Arts' (COLA) "Change the World" Curriculum; (<https://liberal-arts.wright.edu/degrees-and-programs/new-initiatives>)
 - Co-sponsored entrepreneurial programs led by the College of Science and Mathematics (COSM); (ex: <https://webapp2.wright.edu/web1/newsroom/2019/04/18/wright-state-students-brainstorm-solutions-to-plastic-in-oceans-at-innovation-weekend/>)
 - Co-sponsored collaborative initiative between COSM and COLA's Department of Theatre, Dance, and Motion Pictures focused on empowering incoming freshmen (<https://webapp2.wright.edu/web1/newsroom/2016/06/23/theater-theory/>)
- Cincinnati Life Science CEO Roundtable Member (2002-04)
 - Cincinnati Chamber of Commerce, Regional Entrepreneurial Network, "Voice of the Consumer" High-tech Leadership Committee Member (2002)
 - Policy Steering Committee Advisor, Chris Monzel for Cincinnati City Council Campaign (2000)
 - **Christ's Community in College Hill, Trustee (1995-2000), Chairperson (1996-97)**
 - Assisted in operational overhaul and re-budgeting process to enable inter-denominational support for spiritual, physical, emotional, financial, and social needs of residents living in College Hill, Ohio.
 - Coordinated community outreach programs for under-privileged youth and administered volunteer programs to strengthen community, enhance interfaith relationships, and address local challenges including food disparities.

Affiliations

American Heart Association (AHA)

American Society of Gene & Cell Therapy (ASGCT)

American Association for the Advancement of Science (AAAS)