



Curriculum Vitae Prof. Dr. Rena N. D'Souza



Name: Rena N. D'Souza
Born: 22. January 1955 in Bombay, India

Main areas of research: Developmental Biology, Genetics, Stem Cells, Tissue Engineering, Biomaterials

Rena N. D'Souza is a dentist from India who does research in the USA on the genetic foundations underlying the development of teeth. She works on developing innovative processes in order to integrate the knowledge gained from modern molecular biology into dental practices. D'Souza is convinced that it will be possible in the foreseeable future to regenerate sick or lost teeth through the use of stem cells and tissue engineering.

Academic and Professional Career

- since 2015 Associated Director at the department of research matters, University of Utah, Salt Lake City, USA
- 2013 - 2014 Dean of the new School of Dentistry, University of Utah, Salt Lake City, USA
- since 2013 Professor of Dental Sciences, Neurobiology & Anatomy and Pathology, University of Utah, Salt Lake City, USA
- 2006 - 2012 Professor and Chairperson of the Department of Biomedical Sciences at Baylor College of Dentistry, Texas A&M University, Houston, USA
- 1987 Ph.D. at the Graduate School of Biomedical Sciences, Health Science Center, University of Texas, Houston, USA
- 1985 Master of Science at the Graduate School of Biomedical Sciences, Health Science Center, University of Texas, Houston, USA
- 1985 Doctor of Dental Surgery (D.D.S.) at the School of Dentistry, Health Science Center, University of Texas, Houston, USA
- 1977 Bachelor of Dental Surgery at the University of Bombay, India

Studies of Dentistry und Biology at the University of Bombay, India

Functions in Scientific Societies and Committees

- since 2016 Vice president of the International Association for Dental Research (IADR)
- 2013 - 2014 Member of the Physician-Scientist Workforce Working Group (PSW-WG) of the US-National Institutes of Health (NIH)
- 2012 - 2013 President of the American Association for Dental Research (AADR)
- 2008 - 2012 Member of the National Advisory Dental and Craniofacial Research Council (NADCRC) of the National Institutes of Health (NIH)
- since 1984 Member of the International Association for Dental Research (IADR) and the American Association for Dental Research (AADR) with leading function in several committees

Project coordination, Membership in collaborative research projects

- 2011 - 2016 National Institute of Dental & Craniofacial Research (NIDCR): "Self-assembling Peptide Nanofiber Hydrogels for Delivery of Proteins and Cells"
- 2008 - 2014 NIDCR: "Signaling Mechanisms in Early Tooth Development"
- 2009 - 2011 NIDCR: "Baylor's Program for Bioengineering Sciences and Translational Research: B-BEST"
- 2008 - 2012 NIDCR: "Baylor's Scientific Training Program for Dental Academic Researchers: B-STARS"
- 2003 - 2008 NIDCR: "UT-H Comprehensive Research Training Program"
- 1999 - 2012 NIDCR: "Regulation of Runx2 Function by Twist-1 in Tooth Development"
- 1999 - 2004 NIDCR: "OSF2/Cbfa1 and Murine Odontogenesis"
- 1998 - 2003 NIDCR: "Tgf B1's Role in Primary and Reparative Dentinogenesis"
- 1997 - 2000 NIDCR: "Generation and Characterization of DMP1 Deficient Mice"
- 1992 - 1998 NIDCR: "Transforming Growth Factor-Beta and Odontoblast Genesis"

Honours and Awarded Memberships

- since 2012 Member of the German National Academy of Sciences Leopoldina
- 2010 Presidential Award for Research Excellence, Texas A&M Health Science Center
- 2009 Innovation in Oral Care Award, International Association for Dental Research (IADR)

- 2005 Young Investigator Award, Pulp Biology Group, International Association for Dental Research (IADR)
- 2005 Mentor Award, National Student Research Group (NSRG), American Association for Dental Research (AADR)
- 2002 Distinguished Scientist Award, International Association for Dental Research (IADR)
- Fellow of the American College of Dentists
- Fellow of the American Association for the Advancement of Science
- Fellow of the American Association for Dental Research (AADR)
- More than 15 institutional awards for Teaching Excellence

Major Scientific Interests

Rena N. D'Souza is a dentist who does research on the genetic foundations underlying the development of teeth. She works on developing innovative processes in order to integrate the knowledge gained from modern molecular biology into dental practices. D'Souza is convinced that it will be possible in the foreseeable future to regenerate sick or lost teeth through the use of stem cells and tissue engineering.

The development of teeth proceeds in many stages – from buds to caps to bells through to crowns and maturation, in which the dentin, which makes up the bulk of the eventual tooth, and the outer enamel are formed. Since the 1990s D'Souza has been investigating which factors control this process. Important findings have been deduced from insights into the genetic foundations of flawed developments like "cleidocranial dysplasia" (CCD), which typically leads to the delayed appearance of permanent teeth and an excess number of teeth.

D'Souza initially directed her attention to the TGF-beta growth factors, which she correctly assumed played a role in the synthesis of dentin through the agency of the so-called "odontoblasts". She tracked the activity of the Cbfa1 transcription factors from the bud stage to the bell stage and was able to show that mutations of the Cbfa1 genes contributed to "cleidocranial dysplasia". The impaired interaction of two transcription factors (Runx-1, Twist-1), which are normally precisely harmonized, likewise contributes to this tooth anomaly.

In the year 2000 D'Souza caused quite a stir with her discovery of PAX9, a so-called "master gene" that plays a fundamental role in the overall development of teeth. It was through a rare disease pattern discovered in a family in Houston that she became aware of this gene: The first two molars were missing ("Oligodontia") in 21 of the 43 family members. A test showed a dominant hereditary mutation in the PAX9 gene. The discovery of this central control element led D'Souza to entertain an idea that she herself had previously considered a pipe dream: the regeneration of damaged or lost teeth based on the principles of so-called "tissue engineering". In order to trigger the development of new tooth tissue she wants to make use of adult stem cells that already exist in deciduous or wisdom teeth and which could be stored in tissue banks. In conjunction with her colleagues, D'Souza is already working on injectable, self-organizing peptide hydrogels that can

serve as a basic biologically active framework for the formation of complete teeth or of specific tooth tissue.

D'Souza is fully aware of the enormous challenge but is at the same time also convinced of the great potential of such a technology that – when compared to the traditional forms of dental prostheses – would represent a revolutionary breakthrough for dentistry. Like other international research groups, D'Souza has succeeded in forming tooth-like structures through the use of mouse tissue.

Against the background of her personal experience as a dentist and surgeon, Rena N. D'Souza strives to bring pioneering scientific findings into the everyday professional life of dentistry. Many of her strategy papers are aimed at raising the profile of dental research and by doing so promoting the general health of peoples' teeth.

D'Souza demonstrated a strong commitment to discovery and mentoring throughout her academic career and has maintained a portfolio of educational, research and professional leadership accomplishments. She has published in the areas of matrix biology, craniofacial development and genetics, regenerative medicine and dental educational topics.