



Eliminating Implant Failure in Humans with Nanomaterials: 45,000 Cases and Counting

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Abstract

Nanomedicine is the use of nanomaterials to improve disease prevention, detection, and treatment which has resulted in hundreds of US FDA approved medical products. While nanomedicine has been around for several decades, new technological advances are pushing its boundaries. For example, this presentation will present an over 25 year journey of commercializing nanomaterials for orthopedic implants now in over 45,000 patients to date showing no signs of failure. Current orthopedic implants face a failure rate of 5 – 10% and sometimes as high as 60% for bone cancer patients. Further, this talk will present future research directions into using atomic layer deposition (ALD) to create such nanostructures on implants to reduce infection and improve bone growth. Sensors grown off of orthopedic implants using ALD will also be discussed in which cell presence on orthopedic implants can be detected and quantified. Such information can also be communicated to a handheld device to better inform surgeons on chances of implant success or failure. Such sensors can also release pharmaceutical agents and/or nanoparticles on-demand to ensure implant success. New efforts reducing the negative impact of biomaterials on the environment (both during use and during manufacturing) while retaining healing properties will also be discussed. Lastly, this talk will cover how Artificial Intelligence (AI) can be combined into today's orthopedic implants to predict implant success or failure in the years that follow.

Biographical sketch

Thomas J. Webster's (H index: 137) degrees are in chemical engineering from the University of Pittsburgh (B.S., 1995; USA) and in biomedical engineering from RPI (Ph.D., 2000; USA). He has formed over a dozen companies who have numerous FDA approved medical products currently improving human health in over 45,000 patients. He is also currently serving as a professor at Brown University, Saveetha University, Hebei University of Technology, University of the Basque Country, and others. Dr. Webster has numerous awards including: World Top 2% Scientist by Citations (PLOS); SCOPUS Highly Cited Research (Top 1% Materials Science and Mixed Fields); Clarivate Top 0.1% Most Influential Researchers (Pharmacology and Toxicology); Best Materials Science Scientist by Citations (Research.com); and is a fellow of over 8 societies. Prof. Webster is a former President of the U.S. Society for Biomaterials and has over 1,500 publications to his credit with over 75,000 citations. He was recently nominated for the Nobel Prize in Chemistry. Prof. Webster also recently formed a fund to support Nigerian student research opportunities in the U.S.