

Health and Medicine Industry

Innovations in the health and medicine industry have helped us live longer, healthier lives, but there is still much work to be done. Now, more than ever, we are reliant on science and technology to improve public health. With the introduction of health apps, eVisits, wearable technology, and even robots in the operating room, it leaves us questioning – what's next?

National Inventors Hall of Fame Inductees have found solutions for life's common health problems, with many of these innovations still being utilized today.

Per-Ingvar Brånemark's modern dental implants, or bone-anchored restorative solutions, have improved the quality of life for millions of people around the world, giving patients who have experienced tooth loss the ability to eat, smile, and even talk with confidence again. According to the American Academy of Implant Dentistry, 3 million people have dental implants in the United States, which is a testament to Brånemark's technology.

Sheldon Kaplan's EpiPen® Auto-Injector has saved countless lives from anaphylaxis and continues to be the most prescribed auto-injector on the market. With over 15 million Americans suffering from food and insect sting allergies in the United States, this technology is still just as important today as it was 35 years ago when it was first introduced.

This year, Brånemark and Kaplan will be Inducted into the National Inventors Hall of Fame for their groundbreaking contributions to the health and medicine industry.



Per-Ingvar Brånemark

Per-Ingvar Brånemark was a Swedish physician and professor of anatomy. He is known as the pioneer of osseointegration, a term he coined and that was published in 1994 in *Dorland's Illustrated Medical Dictionary*. Osseointegration is the direct anchorage and integration of an implant in living bone by the formation of bony tissue around the implant itself. Today, it is a standard method in dental practice and is frequently used in all types of reconstructive surgery.

Brånemark discovered the technique when he was studying blood circulation and the behavior of red and white cells in different situations. As part of his experiment, he inserted a titanium chamber in a rabbit leg in order to study blood tissue, with plans to remove the chamber for re-use. Unexpectedly, he found that after a period of time, the titanium fused and integrated with the bone without any sign of rejection.

Realizing the implications of this phenomenon, Brånemark continued his research. He performed the first successful dental implant in a human in September 1965. As his work progressed, he devised a complete system of implant posts and instruments as well as training for implementation.

Brånemark changed the field of implant technology, and his observation that the human body could tolerate titanium revolutionized the fields of dental, maxillofacial and orthopedic rehabilitation. Innovative bone-anchored restorative solutions have improved the quality of millions of people's lives around the world. Titanium is now commonly used in knee and joint replacements, prostheses for the head and face, veterinary applications, and even bone-anchored hearing aids. Medical and dental schools now teach the use of osseointegrated implants as a routine part of their standard curricula. Brånemark received his M.D. and Ph.D. from Lund University.



Sheldon Kaplan

Since its introduction in 1980, the EpiPen® Auto-Injector has saved countless lives from anaphylaxis, a severe allergic reaction to foods, drugs, and insect stings, during which airways tighten and blood pressure drops significantly. Anaphylaxis is treated with epinephrine, which opens airways and blood vessels to counteract the symptoms but it must be injected promptly.

Traditionally, epinephrine was drawn from a vial with a syringe, a method both time-consuming and error-prone.

The EpiPen was designed by Sheldon Kaplan at Survival Technology, Inc. (STI). STI had an existing version of an auto-injector made of stainless steel, but its use was limited and also restricted to drugs only stable in that particular alloy. Instead, Kaplan developed a system that allowed for the use of a glass container, while delivering a larger volume of drug.

In 1973, when Kaplan's design concept was almost complete, the Pentagon approached STI looking for a delivery method for a nerve agent antidote not stable in stainless steel. Kaplan's invention became the ComboPen for the Department of Defense and the EpiPen for consumers. The EpiPen enables an individual to swiftly deliver medication by thrusting the auto-injector against a patient's outer thigh to activate a spring-loaded mechanism that launches a needle into the muscle to administer lifesaving medicine.

Kaplan earned his B.S. in mechanical engineering from Northeastern University. He developed a medical kit for NASA's Apollo missions, a pneumatic medical dressing for reconnaissance pilots and numerous other medical and hospital products.