



INTERIM CLINICAL AND PRECLINICAL DATA FROM BIG PHARMA, PREEMINENT RESEARCH INSTITUTIONS AND THE U.S. GOVERNMENT IS PROVIDING VALIDATION THAT INOVIO'S ELECTROPORATION DELIVERY PLATFORM INDUCES POTENT IMMUNE RESPONSES IN HUMANS...

Enabling Breakthrough Vaccines

Electroporation and DNA vaccines

Inovio is a leader in electroporation, with over 200 worldwide patents, plus numerous pending patents in the US and abroad. While the basic delivery capabilities of electroporation are documented by thousands of scientific publications, **Inovio's pioneering work** has led to compelling proprietary IP relating to important human applications of electroporation. In particular, Inovio has achieved tremendous advances and validation for the use of its electroporation-based delivery technology in conjunction with DNA vaccines.



"Inovio is focused on enhancing the delivery, potency and development of the next generation of vaccine technology: DNA vaccines."

Peter Kies
Chief Financial Officer



"Our significant license agreements with vaccine giants Merck and Wyeth bear testimony to the great potential of our technology."

Michael Fons, PhD
VP, Corporate Development



"DNA vaccines need new delivery systems. Our platform has the potential to significantly increase the potency of DNA vaccines."

Dietmar Rabussay, PhD
VP, Research & Development



"With five clinical and multiple preclinical trials underway, we are a leader in electroporation based delivery of DNA vaccines."

Jacob Mathiesen, PhD
Managing Director, Inovio AS

Merck, Wyeth, Moffitt Cancer Center, the U.S. Army, and other partners are employing Inovio's proprietary **electroporation** technology, which enhances local delivery and cellular uptake of useful biopharmaceuticals, in their development of novel DNA vaccines. The goal of vaccination, of course, is to elicit a specific immune response from the body for immediate and lasting disease protection. DNA vaccines are currently being developed to treat and prevent melanoma and other cancers, AIDS, influenza, and numerous other chronic infectious diseases. Based on scientific understanding of the human genome, scientists can now produce small circular pieces of DNA called **plasmids** that are designed to produce specific proteins, called **antigens**, corresponding to a specific cancer or infectious organism. Plasmid-based vaccines can be inexpensively produced in large quantities in bacteria. Using **electroporation**, the DNA vaccines can be administered to a muscle in the patient's arm or leg. The patient's own cells then produce the antigen encoded by the plasmid, which the immune system recognizes as "foreign" and attacks. Researchers have reported success using this method against certain cancers and infectious diseases. As these DNA vaccines work from inside the cell, they are particularly good at helping the body recognize and react to an "invader", for example, by stimulating production of cytotoxic T lymphocytes.

New Paradigm for Vaccines: Prevention and Therapy

DNA vaccines are the *third* generation of vaccine technology. Initially, "live" or "inactivated live" viruses such as smallpox were used as vaccines. The key enabling technologies to make these live vaccines commercially viable were enhancements in stabilizing these viruses so that they could not reproduce. The second generation of vaccines used recombinant proteins instead of an entire virus. These vaccines were enabled by advancements in chemical adjuvants that gave the vaccines a needed boost in the ability to be seen by the immune system. But these earlier technologies do not permit strong T-cell responses considered essential to tackle cancers and chronic infectious diseases such as HIV and hepatitis C. To overcome these limitations, scientists today are strongly focused on a new generation of vaccine technology: **DNA vaccines**. One of the challenges to advancing DNA vaccines is safely and efficiently delivering the vaccine into muscle cells. **Electroporation** is emerging as a potentially vital enabling technology to facilitate vaccine delivery. **Inovio** was **founded based on the concept of electroporation**, which involves the use of millisecond electrical pulses to temporarily permeabilize cell membranes, thereby allowing entry of various types of molecules such as nucleic acids into cells. Inovio has several collaborations with major biotech and pharmaceutical companies, research institutions and the US government for the delivery of DNA via electroporation as a therapeutic *or* preventive vaccine. As a result, Inovio has established a leading position in electroporation for delivering and enabling DNA vaccines.



"Our platform technology, based on electroporation, is being used by major pharmaceutical companies as well as esteemed research institutions and the United States government,"

says Inovio's CEO Avtar Dhillon, MD, who previously practiced family medicine.