

Emerging Company Profile

MaxCyte: Power loading

**By Michael Schuppenhauer
Senior Editor**

As viral vectors used in gene therapy have raised safety concerns, their elimination may be key to progress in the field. MaxCyte Corp. believes that one way to overcome this technical and regulatory hurdle is to insert DNA directly into cells as *ex vivo* therapy without using a viral vector. The company's system relies on electroporation to load large volumes of cells with genes for therapeutic and drug discovery applications.

According to CEO Douglas Doerfler, the key advantage of the company's approach is that only the antigen or compound is presented to the target cells, meaning they cannot exhibit an immune reaction to a viral vector. In addition, viral vectors with plasmids may integrate in cells that are not the desired target.

MaxCyte's GT cell loading system places electroporation in a bedside cassette next to blood cell processing units for therapeutic and clinical applications that may be performed near the patient. According to Doerfler, conventional approaches require that cells taken from patients be processed in central labs, which takes time and adds issues of quality control and logistics to therapy.

According to Doerfler, more than 50% of B cells, T cells, dendritic cells and stem cells are successfully transfected using MaxCyte's process. The company also has seen greater than 90% transfection of fibroblasts, myoblasts and CHO cells. When these cell types are transfected with proteins such as erythropoietin, IL-2 and IL-12, the company says that more than 70% of the cells are viable following processing.

The system's production rate is above 600 million cells per minute. Starting from a purified and separated cell fraction, which can be derived either from blood or tissue, cells are loaded with plasmids or

MaxCyte Corp.

Rockville, Md.

Technology: Flow electroporation for non-viral gene and drug delivery and drug discovery

Disease focus: Cancer, cardiovascular

Clinical Status: Phase I

Founded: 1999 by Douglas Doerfler and John Holaday

Corporate partners: Angiogene Inc., Northern Therapeutics Inc.

University collaborators: University of Cincinnati, Baylor College of Medicine, Harvard University, Walter Reed Army Hospital and the NIH

Number of employees: 16

Funds raised: \$8 million

Investors: Maryland Department of Business and Economic Development; Montgomery County Department of Economic Development; VenCap (Invesco); and EntreMed Inc.

CEO: Douglas Doerfler

Patents: 6 issued covering sterile closed-flow clinical electroporation

drugs and then undergo a recovery step of 10-30 minutes, followed by a wash step. The recovered fraction can either be administered to the patient by injection or be split for future therapies. The entire procedure takes less than an hour, Doerfler said.

Doerfler said that most of MaxCyte's customers are looking for transient expression of genes in cells and thus are interested in integration into the cytoplasm as opposed to long-term integration into cell nuclei. However, the company has programs in place to offer long-term transfection into the nuclei.

The technology also can be used to load cells with small molecules.

For its own account, the company has filed a device master file with the FDA in preparation for Phase I trials, and expects at least two trials using its technology to begin this year.

In oncology, MaxCyte is in preclinical testing in chronic lymphocytic leukemia (CLL) with a combination of two plasmids, one encoding a human CD40 ligand and the other encoding IL-2. The therapy will move into Phase I trials this quarter. At the American Society of Gene Therapy last year, the company reported that 15 hours after transfection with a plasmid encoding a CD40 ligand, 21-59% of chronic lymphocytic leukemia (CLL) B cells expressed CD40L as measured by flow cytometry.

The company also has projects in preclinical development using IL-12 to treat renal cell carcinoma (RCC), and using a whole tumor lysate in dendritic cells to treat melanoma. The melanoma product could move into the clinic in 2003, according to Doerfler.

In its partnered programs, MaxCyte is combining its GT system with AngioCell gene therapy from Angiogene Inc. to load muscle precursor cells with a gene construct that stimulates angiogenesis. Angiogene (Montreal, Quebec) will conduct preclinical testing to assess the combination's ability to stimulate blood vessel growth and improve cardiac function to treat congestive heart failure (CHF).

In collaboration with Northern Therapeutics Inc. (Montreal, Quebec), an affiliate of United Therapeutics Corp. (UTHR, Silver Spring, Md.), MaxCyte is developing treatments for pulmonary arterial hypertension and other chronic pulmonary disorders using undisclosed plasmids and Northern's autologous gene therapy approach. The partners expect to file an IND with the FDA this year.

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