Moderna Announces Dosing of the First Monoclonal Antibody Encoded by mRNA in a Clinical Trial

February 5, 2019

Antibody against Chikungunya virus (mRNA-1944) is the first development candidate from Moderna's systemic therapeutics modalities to start human dosing

CAMBRIDGE, Mass.--(BUSINESS WIRE)--Feb. 5, 2019-- Moderna, Inc., (Nasdaq: MRNA) a clinical stage biotechnology company pioneering messenger RNA (mRNA) therapeutics and vaccines to create a new generation of transformative medicines for patients, today announced the dosing of the first subject in a Phase 1 clinical trial evaluating the safety and tolerability of escalating doses of mRNA-1944 via intravenous infusion in healthy adults. This is the first monoclonal antibody encoded by mRNA to be dosed in a human and the first development candidate from the Company's systemic therapeutics modalities to start clinical testing.

"We believe this trial will give us important information about how mRNA may be used to make systemically-available complex therapeutic proteins in a consistent, dose-dependent fashion," said Tal Zaks, M.D., Ph.D., chief medical officer at Moderna. "Dosing the first monoclonal antibody encoded by mRNA in humans is a significant milestone for our team and mRNA platform. We look forward to learning about the functionality of our mRNA-encoded antibody in neutralizing the Chikungunya virus."

mRNA-1944 encodes a fully human IgG antibody originally isolated from B cells of a patient with a prior history of potent immunity against Chikungunya infection. It is composed of two mRNAs that encode the heavy and light chains of this anti-Chikungunya antibody within Moderna's proprietary lipid nanoparticle (LNP) technology. Preclinical studies of mRNA-1944 showed linear dose-dependence, meaning increases in the dose of mRNA led to nearly proportionate increases in antibody production.

The research and development of mRNA-1944 was financially supported by the Defense Advanced Research Projects Agency (DARPA), an agency of the U.S. Department of Defense.

About the Study

The randomized, placebo-controlled Phase 1 study is designed to evaluate the safety and tolerability of up to four ascending dose levels (0.1, 0.3, 0.6, 1 mg/kg cohorts with 8 subjects per cohort) of mRNA-1944 in healthy adults, administered via intravenous infusion. Other objectives are to determine pharmacodynamics in the form of serum antibody expression and whether the antibodies produced against the Chikungunya virus are sufficiently active to neutralize viral infection *in vitro*. More information about the study can be found at ClinicalTrials.gov.

About Moderna's Systemic Therapeutics Modalities

Moderna has 21 mRNA development candidates in its pipeline, with 12 programs now in clinical development. These investigational medicines are grouped together into six modalities based on similar mRNA technologies, delivery technologies and manufacturing processes. Typically, programs within a modality will also share similar pharmacology profiles, including the desired dose response, the expected dosing regimen, the target tissue for protein expression, safety and tolerability goals as well as their pharmaceutical properties.

Moderna scientists designed the Company's ***systemic secreted therapeutics modality*** to achieve a therapeutic effect in one or more tissues or cell types by increasing levels of desired secreted proteins outside the cell, either in circulation or in contact with the extracellular environment. The goal of this modality is to provide secreted proteins, such as antibodies or enzyme replacement therapies across a wide range of diseases, such as infectious diseases and rare genetic diseases. Three development candidates are currently included in this modality: antibody against Chikungunya virus (mRNA-1944 in a Phase 1 study); Relaxin (AZD7970 in IND-enabling GLP toxicology studies); andFabry disease (mRNA-3630 in IND-enabling GLP toxicology studies).

The ***systemic intracellular therapeutics modality*** uses the same delivery technology and was designed to achieve a therapeutic effect in one or more tissues or cell types by producing proteins encoded by mRNA inside the cell, either located in the cytosol or specific organelles, like the mitochondria. The goal of this modality is to provide intracellular proteins, such as intracellular enzymes and organelle-specific proteins, as safe, tolerable and efficacious therapies. Moderna currently has three programs in this modality focused on rare genetic diseases that cannot be addressed using recombinant proteins. These include methylmalonic acidemia or MMA (mRNA-3704 with an open IND for a Phase 1/2 study); Propionic Acidemia or PA (mRNA-3927 in IND-enabling GLP toxicology studies); andPhenylketonuria or PKU (mRNA-3283 in IND-enabling GLP toxicology studies).

About Chikungunya

Chikungunya is a mosquito-borne virus that poses a significant public health problem in tropical and subtropical regions. The disease is characterized by an acute onset of fever, rash, muscle pain, and sometimes debilitating pain in multiple joints. There are currently no effective therapies or approved vaccines to treat or prevent Chikungunya infection or disease, and effective mosquito control is challenging. Currently, people infected with Chikungunya are treated with non-steroidal anti-inflammatory drugs to relieve some symptoms. In addition to a systemic secreted antibody that could provide passive immunity, Moderna is also exploring using mRNA to encode viral antigens as a prophylactic vaccine against the Chikungunya virus (mRNA-1388).

About Moderna

Moderna is advancing messenger RNA (mRNA) science to create a new class of transformative medicines for patients. mRNA medicines are designed to direct the body's cells to produce intracellular, membrane or secreted proteins that can have a therapeutic or preventive benefit and have the potential to address a broad spectrum of diseases. Moderna's platform builds on continuous advances in basic and applied mRNA science, delivery technology and manufacturing, providing the Company the capability to pursue in parallel a robust pipeline of new development candidates.

Moderna is developing therapeutics and vaccines for infectious diseases, immuno-oncology, rare diseases and cardiovascular diseases, independently and with strategic collaborators.

Headquartered in Cambridge, Mass., Moderna currently has strategic alliances for development programs with AstraZeneca, Plc. and Merck, Inc., as well as the Defense Advanced Research Projects Agency (DARPA), an agency of the U.S. Department of Defense; the Biomedical Advanced Research and Development Authority (BARDA), a division of the Office of the Assistant Secretary for Preparedness and Response (ASPR) within the U.S. Department of Health and Human Services (HHS). Moderna has been ranked in the top ten of *Science's* list of top biopharma industry employers for the past four years. To learn more, visit www.modernatx.com.

Special Note Regarding Forward-Looking Statements

This press release contains forward-looking statements within the meaning of the Private Securities Litigation Reform Act of 1995, as amended including, but not limited to, statements concerning: the belief that mRNA therapies can make complex secreted proteins; Moderna's ability to move further programs into clinical trials; the expected outcomes of the Phase 1 clinical trial for antibody against Chikungunya virus (mRNA-1944); and the expected outcomes of the Moderna's other clinical trials. In some cases, forward-looking statements can be identified by terminology such as "will," "may," "should," "expects," "intends," "plans," "aims," "anticipates," "believes," "estimates," "predicts," "potential," "continue," or the negative of these terms or other comparable terminology, although not all forward-looking statements contain these words. The forward-looking statements in this press release are neither promises nor guarantees, and you should not place undue reliance on these forward-looking statements because they involve known and unknown risks, uncertainties and other factors, many of which are beyond Moderna's control and which could cause actual results to differ materially from those expressed or implied by these forward-looking statements. These risks, uncertainties and other factors include, among others: whether preclinical results for mRNA-1944 will be predictive of future clinical study results; whether mRNA-1944 could be unsafe or intolerable during clinical studies; preclinical and clinical development is lengthy and uncertain, especially for a new class of medicines such as mRNA, and therefore our preclinical programs or development candidates may be delayed, terminated, or may never advance to or in the clinic; no mRNA drug has been approved in this new potential class of medicines, and may never be approved; mRNA drug development has substantial clinical development and regulatory risks due to the novel and unprecedented nature of this new class of medicines; and those described in Moderna's Prospectus filed with the U.S. Securities and Exchange Commission (SEC) on December 7, 2018 and in subsequent filings made by Moderna with the SEC, which are available on the SEC's website at www.sec.gov. Except as required by law, Moderna disclaims any intention or responsibility for updating or revising any forward-looking statements in this press release in the event of new information, future developments or otherwise. These forward-looking statements are based on Moderna's current expectations and speak only as of the date hereof.

View source version on businesswire.com: https://www.businesswire.com/news/home/20190205005531/en/

Source: Moderna

Moderna Contacts:
Investors:
Lorence Kim
Chief Financial Officer
617-209-5849
Lorence.kim@modernatx.com
Media:
Jason Glashow
Head, Corporate Communications
617-674-5648
Jason.glashow@modernatx.com