Moderna Announces Pipeline and Corporate Update
September 14, 2017

**Phase 1 studies underway for seven mRNA medicines**

Moderna achieves key milestones advancing mRNA therapeutics for cardiovascular diseases, cancer and rare liver diseases

**Pipeline comprises 16 development candidates, including first therapeutic for rare liver disease methylmalonic acidemia (MMA)**

Clinical Study Highlights:

- Successful completion of AstraZeneca’s Phase 1 study of first mRNA therapeutic, mRNA AZD-8601 (VEGF-A); Phase 2a study preparations underway
- Initiation of Phase 1 study of mRNA-2416, Moderna’s first immuno-oncology therapeutic, targeting intratumoral expression of membrane-bound OX40L
- Initiation of DARPA-supported Phase 1 study of mRNA-1388, a Chikungunya vaccine; fifth prophylactic vaccine to enter clinical study

New Preclinical Development Candidate Nominations:

- mRNA-3704, first therapeutic for severe, life-threatening rare liver disease, methylmalonic acidemia (MMA)
- mRNA-5671, a cancer vaccine for the treatment of KRAS-mutated cancers of the lung, colorectum and pancreas
- mRNA-2752, an intratumoral immuno-oncology triple combination mRNA encoding for OX40L+IL23+IL36y
- mRNA MRK-1278, second prophylactic vaccine under Merck collaboration
- mRNA-1893 replaces mRNA-1706 as backup Zika vaccine

CAMBRIDGE, Mass., September 14, 2017 — Moderna Therapeutics, a clinical stage biotechnology company that is pioneering messenger RNA (mRNA) therapeutics and vaccines to create a new generation of transformative medicines for patients, provided an update today, noting continued progress of clinical programs and the introduction of several new development candidates (DCs) across its broad, diverse development pipeline. Moderna announced the update in conjunction with an Investor R&D Day hosted by its management team this morning in New York.

A Phase 1 study of mRNA AZD-8601, the first-ever mRNA therapeutic to be evaluated in a clinical study, has been successfully completed. mRNA AZD-8601 is anticipated to move into Phase 2 development. mRNA AZD-8601 is being developed by Moderna’s partner AstraZeneca to express a local and transient surge of vascular endothelial growth factor-A (VEGF-A) as a potential treatment for cardiovascular diseases. The Phase 1 randomized, double-blind, placebo-controlled, single ascending dose study, which assessed the safety, tolerability and pharmacokinetics (PK) of mRNA-AZD-8601 after single dose administration in male patients with Type 2 diabetes mellitus was successfully completed. The study met its primary endpoint of safety and tolerability and also demonstrated proof of mechanism as measured by expression of VEGF-A protein in the skin (protein PK).

AstraZeneca has submitted a Clinical Trial Application (CTA) in Europe to initiate a Phase 2a study of mRNA AZD-8601 in heart failure patients undergoing coronary artery bypass grafting (CABG) surgery.

Moderna initiated a Phase 1 study of mRNA-2416, an intratumoral (iTu) immuno-oncology (I-O) therapeutic that encodes for the membrane expression of the co-stimulatory protein OX40 Ligand, or OX40L, to potentially enhance T-cell attack against tumors. This is Moderna’s first I-O therapeutic to enter clinical study.

Moderna also unveiled its first clinical development candidate (DC) that utilizes a novel modality, liver expression of therapeutic proteins. Utilizing this modality, the company will advance toward the clinic an mRNA DC, mRNA-3704, for methylmalonic acidemia (MMA), a serious and often life-threatening rare liver disease for which there are no approved therapies.

In total, Moderna announced the addition of four new DCs to its development pipeline today. The company also announced that it has replaced its preclinical stage Zika vaccine DC, mRNA-1706, with mRNA-1893, a Zika vaccine with an enhanced mRNA construct anticipated to augment immunogenicity. Moderna’s development pipeline now comprises 16 mRNA therapeutics and vaccines spanning infectious diseases, cancer (I-O), cardiovascular diseases and rare liver diseases. Approximately 460 subjects have been dosed to date across clinical studies for seven mRNA vaccines and therapeutics.

“2017 is a major inflection point for Moderna, as we’ve made significant progress advancing mRNA therapeutics for unmet needs across several disease areas,” said Stéphane Bancel, Chief Executive Officer of Moderna. “In the cardiovascular space, our partner AstraZeneca successfully completed a Phase 1 study for mRNA AZD-8601, a VEGF-A therapeutic, and planning is underway for a Phase 2a study. In addition, we have initiated first-in-human dosing in a Phase 1 study of mRNA-2416, our first immuno-oncology candidate, encoding OX40 ligand. We also have progressed the expression of therapeutic proteins in the liver as a development stage modality. As such, we are now able to advance chronically dosed mRNA therapeutics to development for rare liver diseases. I’m very thankful to the Moderna team for their commitment, dedication and continued progress to deliver on our mission.”

Mr. Bancel added, “This past May we experienced the extremely sad, untimely loss of Henri Termeer, a Moderna board member, and a dear friend and mentor to so many of us at Moderna and across our industry. Henri was tirelessly dedicated to helping patients, particularly those impacted by rare diseases. We hope to honor his remarkable legacy by delivering on the promise of mRNA science for patients.”

**MRK-1278 replaces mRNA-1706 as backup Zika vaccine**
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<th>Lead</th>
<th>Indication / Target</th>
<th>Formulation</th>
<th>GLP Toxicology</th>
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**Infectious Diseases**

**Immunology**

| mRNA-4157                  | Moderna | Merck | Personalized Cancer Vaccine | V1GL | ✔  | ✔ | Safe to Proceed to Clinic |
| mRNA-5671                  | Moderna |       | KRAS                        | V1GL | ✔  |               |              |
| mRNA-2416                  | Moderna |       | OX40L                       | N1GL | ✔  | ✔ | Started: Aug '17 |
| mRNA-2752                  | Moderna |       | OX40L+ IL23+IL35            | N1GL | ✔  |               |              |
| mRNA-2905                  | AstraZeneca | Moderna | IL12                      | N1GL | ✔  |               | Ongoing      |

**CV Diseases**

| mRNA AZD-8601             | AstraZeneca | VEGF-A | Citrate / Saline | ✔  | ✔ | Fully enrolled | CTA filed |

**Rare Liver Diseases**

| mRNA-3704                  | Moderna | MMA | N2GL |               |               |               |              |


**Abbreviations:** GLP = good laboratory practice; IND = investigational new drug; CTA = clinical trial authorization; CMV = cytomegalovirus; HMPV = human metapneumovirus; IL = interleukin; MMA = methylmalonic acidemia; OX40L = OX40 ligand; PIV3 = parainfluenza virus 3; VEGF-A = vascular endothelial growth factor-A.
mRNA is a fundamental component of human biology, giving cells the instructions they need to make proteins that carry out every function of the body. Moderna is using mRNA as a drug to direct cells in the body to produce proteins to fight or prevent disease. Moderna combines elements of its mRNA platform into distinct approaches, called modalities, to address diseases. A modality is a technological solution set that Moderna can deploy to create a family of medicines for different diseases.

Moderna’s pipeline now comprises 16 mRNA DCs across five modalities: prophylactic vaccines, therapeutic vaccines, intratumoral immuno-oncology therapeutics, localized therapeutics and liver therapeutics. Moderna also has an mRNA lung therapeutics modality that is currently in the research stage, in which Vertex and Moderna are researching potential mRNA therapeutics for cystic fibrosis.

“As we are very pleased with the progress our team has made advancing our proprietary, next-generation formulations, including N2GL,” said Stephen Hoge, President of Moderna. “Based on our preclinical data we believe these represent a dramatic step change in performance, which we will submit for publication in the coming months. Combining formulations like N2GL with other platform improvements has allowed us to progress mRNA medicines for devastating rare metabolic diseases into development, the first of which is methylmalonic acidemia, or MMA.”

mRNA Prophylactic Vaccines Modality

Prophylactic Vaccines — Clinical Development Updates

- Enrollment completed for Phase 1 studies of mRNA-1440 (influenza A virus subtype H10N8 vaccine) and mRNA-1851 (influenza A virus subtype H7N9 vaccine): The ongoing Phase 1 studies for mRNA-1440 (H10N8 mRNA vaccine) and mRNA-1851 (H7N9 mRNA vaccine) have completed enrollment, with 201 and 156 healthy volunteers enrolled, respectively. Both studies remain active, with subjects continuing to be followed for safety monitoring.

- Phase 1 study of mRNA MRK-1777 continues to progress: A Phase 1 randomized, placebo-controlled, dose-ranging study of mRNA MRK-1777, an mRNA prophylactic vaccine program for an undisclosed target, continues to enroll healthy volunteers. mRNA MRK-1777 is the first named DC under the existing collaboration between Merck and Moderna to discover and develop mRNA-based vaccines against viral diseases. Moderna is conducting the Phase 1 study of mRNA MRK-1777.

- Phase 1 study of Chikungunya vaccine, mRNA-1386, initiated: In August, Moderna began enrolling healthy volunteers in the US for a Phase 1 study of mRNA-1386, an mRNA Chikungunya prophylactic vaccine. The randomized, placebo-controlled, dose-ranging study will evaluate the safety and immunogenicity of mRNA-1386 in healthy adults.

Chikungunya typically causes mild fever and transient joint pain. In approximately 15 percent of infected patients, it can cause long-term, severe arthritis. Chikungunya historically has been limited to warmer climates in Asia and Africa, but recent cases have been identified in the Americas and Europe. Currently, there is no approved vaccine for Chikungunya.

- Clinical development of mRNA-1388 is supported by an award from the Defense Advanced Research Projects Agency (DARPA), an agency of the U.S. Department of Defense.

- Phase 1/2 study of Zika mRNA vaccine, mRNA-1325, continues to progress: Moderna continues to enroll healthy subjects in a Phase 1/2 study of mRNA-1325, a Zika mRNA vaccine. The randomized, placebo-controlled, dose-ranging study is underway in the US.

Children born to mothers infected with Zika can develop microcephaly, a severe disease characterized by abnormally small heads and severe neurologic disabilities. Zika infection is also strongly associated with Guillain-Barré Syndrome (GBS), an autoimmune disease that attacks the peripheral nervous system, leading to rapidly progressive and potentially life-threatening muscle weakness. GBS can lead to death caused by respiratory arrest if a patient is not ventilated. Currently, there are no treatment options or approved vaccines for the Zika virus or congenital Zika syndrome.

Moderna received a funding award of up to $125 million from 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), to accelerate development of its Zika mRNA vaccine.

Prophylactic Vaccines — Preclinical Development Updates

- Additional mRNA prophylactic vaccine DCs continue to advance: Moderna continued to make progress advancing three additional mRNA prophylactic vaccine DCs toward the clinic, all of which utilize one of the company’s proprietary, novel formulations, V1GL:

  - mRNA-1893, a Zika mRNA vaccine, replaced mRNA-1706, a Zika mRNA vaccine previously announced by Moderna. mRNA-1706 contained the same active pharmaceutical ingredient (API) as Moderna’s mRNA-1325 Zika mRNA vaccine, but utilized Moderna’s V1GL formulation. Based on experience with other mRNA-encoded antigens, the leader sequence of the Zika antigen in
mRNA-1325, which encodes a signal peptide that instructs the cell to secrete the protein, was from an Immunoglobulin E, or IgE, protein (a type of antibody).

In a published paper in Cell on Moderna’s Zika mRNA vaccine, researchers found that using a leader sequence from the Japanese encephalitis virus (JEV) led to improved immunogenicity and superior protection versus IgE in viral challenge models.

Following further investigation, Moderna has decided to replace mRNA-1706 with a new DC, mRNA-1893, that uses the JEV signal peptide. mRNA-1893 also utilizes Moderna’s V1GL formulation. While GLP toxicity studies had been successfully completed for mRNA-1706, given mRNA-1893 has a unique API, Moderna will now proceed with conducting GLP toxicity studies on this new, enhanced Zika mRNA vaccine.

- **mRNA-1647, a cytomegalovirus (CMV) mRNA vaccine**, which consists of six mRNAs, including five proteins (gH, gL, UL128, UL130 and UL131A) designed to express the Pentamer complex, and one CMV antigen, the herpesvirus glycoprotein (gP) protein. GLP toxicity studies have been successfully completed for mRNA-1647.
- **CMV is the most common cause of newborn deafness, leading to deafness, microphalia (small, not fully developed heads and severe disabilities), vision loss and mental deficiencies, among other serious complications. It is also the most frequent viral disease in transplant recipients, often leading to transplant failure. Currently, there is no approved vaccine for CMV.**

- **mRNA-1653, a combination human metapneumovirus (HMPV) and parainfluenza virus (PIV3) vaccine**. GLP toxicity studies have been successfully completed for mRNA-1653. HMPV and PIV3 typically cause mild respiratory illness, but can become severe in young children, the elderly and other immunocompromised adults. HMPV and PIV3 are the second and third most common causes, respectively, of lower respiratory hospitalizations in children, behind RSV. Currently, there is no approved vaccine for either HMPV or PIV3.

**Second Merck-partnered infectious disease mRNA vaccine DC named, mRNA MRK-V213**: Merck named its second DC, mRNA MRK-V213, under its existing collaboration with Moderna to discover and develop mRNA-based vaccines against viral diseases. mRNA MRK-V213 is for an undisclosed infectious disease indication.

### Prophylactic Vaccines Publications

- **First human proof-of-concept data published in Molecular Therapy**: In April 2017, Moderna published in the journal Molecular Therapy positive interim data from a 100 µg intramuscular (IM) cohort from its ongoing Phase 1 study of mRNA-1440, an influenza A virus subtype H10N8 mRNA prophylactic vaccine. 31 subjects were enrolled in the cohort, 23 of whom received mRNA-1440 and 8 of whom received placebo. mRNA-1440 demonstrated strong efficacy-based Hemagglutination Inhibition Assay (HAI) and Microneutralization Assay (MN) titers, two measures of immunogenicity in response to vaccination, and was safe and well-tolerated. 100% (n = 23) and 87% (n = 20) achieved titer consistent with protection at day 43 as measured by HAI titers and MN titers, respectively, compared to 0% in the placebo arm.

These were the first-ever published data demonstrating an mRNA vaccine’s ability to elicit robust prophylactic immunity in humans, as well as the first human proof-of-concept data from Moderna’s mRNA platform.

- **First Zika mRNA vaccine preclinical data published in Cell**: In February, the first pre-clinical data for Moderna’s Zika mRNA vaccine were published in Cell. The data demonstrated that an mRNA vaccine encoding for Zika prM-E protected against Zika virus in three different mouse strains after two doses: prime plus boost. Extraordinarily high titers of neutralizing antibodies were produced, achieving sterilizing immunity. In addition, a fusion loop mutant vaccine reduced production of potentially disease-enhancing anti-Dengue antibodies. The research was led by Moderna scientists and researchers at the Washington University School of Medicine.

- **Preclinical Data Showing Zika mRNA Vaccine Prevents In Utero Transmission Published in Cell**: In July, data were published in Cell demonstrating that Moderna’s Zika mRNA vaccine prevented Zika virus transmission from pregnant mice to their fetuses. The findings also demonstrated that Moderna’s Zika mRNA vaccine protected the placenta and fetus from Zika virus induced injury. In the study, Moderna’s Zika mRNA vaccine was evaluated in addition to a live-attenuated vaccine candidate developed by the University of Texas Medical Branch (UTMB). The research was conducted by scientists from the National Institute of Allergy and Infectious Diseases (NIAID), part of the National Institutes of Health (NIH), Washington University School of Medicine and UTMB.

### Therapeutic Vaccines — Clinical Development Updates

**mRNA Therapeutic Vaccines Modality**

Moderna’s mRNA therapeutic vaccines utilize one of the company’s proprietary formulations, V1GL.

**Therapeutic Vaccines — Clinical Development Updates**

- **IND for mRNA-based personalized cancer vaccine (PCV), mRNA-4157, filed and deemed safe to proceed to clinic**: Moderna filed an IND with the FDA for mRNA-4157, its mRNA-based PCV, and has received a safe to proceed notification from the FDA.

Moderna, under its existing collaboration with Merck to develop personalized cancer vaccines (PCVs), will evaluate mRNA-4157 in combination with Merck’s anti-PD-1 therapy, KEYTRUDA® (pembrolizumab). Under this IND, Moderna will identify neoepitopes present in a patient’s tumor and then create an mRNA-based PCV encoding for approximately 20 neoepitopes. When injected into the patient, the mRNA-based PCV will direct the patient’s cells to express the selected neoepitopes. In turn, this may help the patient’s immune system better recognize cancer cells as foreign and eradicate them. mRNA-4157 also has the potential to enhance clinical outcomes associated with checkpoint inhibitor therapies. Leveraging its rapid cycle time, small-batch manufacturing technique and digital infrastructure, Moderna plans to manufacture and supply each individually tailored and manufactured PCV to patients within weeks.

- **National Cancer Institute (NCI) to sponsor and conduct study of mRNA-based PCV**: In collaboration with Moderna, the Surgery Branch of the NCI’s Center for Cancer Research will sponsor and conduct a Phase 1/2 study to investigate the safety and immunogenicity of mRNA-based PCVs for patients with advanced-stage, metastatic cancers under the direction of Steven A. Rosenberg, M.D., Ph.D., Chief of Surgery, NCI. NCI will supply Moderna with amino acid sequences of confirmed and predicted neoepitopes for up to 12 patients. Based on these sequences, Moderna will manufacture an mRNA-based personalized cancer vaccine (NCI-4650) for each patient.

**Therapeutic Vaccines — Preclinical Development Updates**

- **New KRAS cancer vaccine DC named, mRNA-6761**: Moderna has named a novel cancer vaccine DC that encodes for KRAS epitopes. KRAS is one of the most frequently mutated oncogenes in human cancer (approximately 30% of all cases). KRAS mutations are found principally in non-small cell lung cancer (NSCLC), colorectal cancer and pancreatic cancer, and are associated with worse outcomes. Hotspots of KRAS mutations are found in different tumor types and can serve as tumor rejection epitopes. Presentation of these epitopes to the immune system may elicit a robust anti-tumor response. For this vaccine, Moderna plans to include an mRNA that encodes for the most commonly found KRAS mutations, which will cover most of the mutations that occur in NSCLC, colorectal cancer and pancreatic cancer. Moderna has successfully completed GLP toxicity studies for mRNA-6761.

**mRNA Intratromal (iTu) Immuno-Oncology (I-O) Modality**

Moderna’s intratumoral (iTu) immuno-oncology (I-O) therapies utilize one of the company’s proprietary formulations, V1GL.

**iTu I-O Therapeutics — Clinical Development Updates**

- **Phase 1 study of mRNA-2416 (encoding for OX40 Ligand, or OX40L) initiated**: In August, Moderna began dosing for a Phase 1 study of mRNA-2416, an iTu I-O therapeutic targeting OX40L. This marks the first iTu I-O program from Moderna’s pipeline to move into clinical study. The Phase 1 open-label, multicenter, dose escalation study of mRNA-2416 is designed to determine the safety and tolerability of escalating iTu doses of mRNA-2416 in patients with relapsed/refractory solid tumor malignancies or lymphoma, and define the maximum tolerated dose (MTD) and recommended dose for expansion (ROE) and schedule for iTu injections of mRNA-2416. The study will enroll patients up to 10 sites in the US.

OX40L is a powerful co-stimulatory protein that enhances the expansion, function and survival of T cells and creates an attack on cancer cells. When mRNA-2416 is delivered directly into a tumor, cells in the tumor express the OX40L protein as a membrane-bound homotrimer on their surface, which, in turn, may lead to a stronger T cell attack against the tumor. mRNA-2416 may elicit an abscopal effect in metastatic cancer, in which localized injection into one tumor would lead not only to shrinking of that tumor but also shrinking of tumors elsewhere in the body.

**iTu I-O Therapeutics — Preclinical Development Updates**

- **ITu triple combination iTu-I therapeutic, mRNA-2752, nominated**: mRNA-2752 is a triple combination iTu-I therapeutic that leverages the multi-target activation enabled by Moderna’s mRNA technology to enhance immune response against tumors. Specifically, mRNA-2752 comprises three mRNAs that express OX40L, Interleukin 23 (IL23) and Interleukin 36 γ (IL36γ). OX40L is a powerful co-stimulatory protein that enhances the expansion, function and survival of T cells to mount an attack against cancer cells. IL23 and IL36γ are secreted proteins that have established roles in mediating immune responses and have been implicated in driving various inflammatory diseases. The three mRNAs are co-formulated and injected directly into a tumor. ITu delivery may enable delivery of targets locally that are too toxic systemically. mRNA-2752 may also elicit an abscopal effect in metastatic cancer. In addition, based on pre-clinical models, Moderna anticipates synergies combining mRNA-2752 with checkpoint inhibitors. In April, Moderna gave oral and poster presentations at the American Association for Cancer Research (AACR) Annual Meeting in Washington, D.C., demonstrating that the triple combination of OX40L, IL23 and IL36γ has potent and durable anti-tumor activity in multiple preclinical models.

- **GLP toxicity studies for mRNA LI2:1 ITu-I, mRNA-2995, ongoing**: GLP toxicity studies continue for mRNA-2995, an ITu-I mRNA therapeutic that encodes for IL12, a powerful cytokine that activates the immune system after being released from cells. When mRNA-2995, a partnered program with AstraZeneca, is delivered directly into a tumor, cells in the tumor express IL12 at a high concentration in the local microenvironment, which, in turn, may lead to a stronger T cell attack against the tumor. By expressing IL12 locally, systemic side effects that previously have been seen from delivery of the IL12 protein into the blood may be more manageable. Moderna is also investigating the potential of mRNA-2995 to elicit an abscopal effect in metastatic cancer. Combining mRNA-2995 with
In July, Moncef Slaoui was announced as Moderna’s partner in a Phase 1 study for mRNA AZD-8601, an mRNA localized therapeutic being developed by Moderna’s partner AstraZeneca that encodes for vascular endothelial growth factor-A (VEGF-A), has been successfully completed. The Phase 1 randomized, double-blind, placebo-controlled, single ascending dose study assessed the safety, tolerability and pharmacokinetics (PK) of mRNA-8601 after single dose administration in male patients with Type 2 diabetes mellitus. The study met its endpoint of safety and tolerability and also demonstrated proof of mechanism as measured by expression of VEGF-A in the skin (protein PK).

When directed via local tissue injection, VEGF-A mRNA may potentially lead to the creation of more blood vessels and improved blood supply. mRNA AZD-8601 could one day provide a unique regenerative treatment option for patients with heart failure after a heart attack, as well as for diabetic wound healing and other ischemic vascular diseases.

AstraZeneca has submitted a Clinical Trial Application (CTA) in Europe to initiate a Phase 2a study of mRNA AZD-8601 in heart failure patients undergoing coronary artery bypass grafting (CABG) surgery.

“The potential impact of harnessing mRNA as a therapeutic to address human disease has long been understood, but the possibility of translating this potential into reality had remained elusive given the complexities of using mRNA as a drug,” said Tal Zaks, Chief Medical Officer at Moderna. “We’ve reached an important milestone with the successful completion of the Phase 1 study of mRNA-AZD-8601. And the Phase 2a study of mRNA-AZD-8601 in patients undergoing coronary artery bypass grafting surgery will provide further insight into the potential of VEGF-A mRNA to provide a unique regenerative treatment option for patients with cardiovascular disease. Seeing the first mRNA therapeutic program move to Phase 2 study will be an important step for the entire mRNA field.”

New liver therapeutic modality advanced from research to development stage: Moderna advanced liver therapies from a research modality to a development modality through technology advancements that are believed to enable intravenous (IV) chronic dosing of IV therapies that will express protein in the liver. This may enable Moderna to address many serious diseases that are undruggable with existing drug development approaches. This is Moderna’s fifth modality to advance to the development stage.

Many diseases, including many rare genetic diseases, are caused by defects or deficits in proteins expressed by liver cells. By delivering mRNA drugs via IV to the liver, and directing liver cells to express functional proteins, Moderna can potentially stimulate production of therapeutic proteins in ways that cannot be achieved with other current technologies.

Liver Therapeutics — Preclinical Development Updates

First liver therapeutic DC nominated, mRNA-3704 for methylmalonic acidemia (MMA), a rare liver disease: MMA is a rare, autosomal recessive organic acidemia/aciduria, most commonly (approximately 60% of cases) caused by a deficiency of the enzyme methylmalonic CoA mutase, or MUT, due to a defective or missing MUT gene. MUT is primarily a pediatric disease with onset in early infancy. The majority of patients with MMA have no functional MUT enzyme, leading to, on average, three life-threatening metabolic crises per year. As a result, MMA is associated with significant mortality and morbidity, and there are no approved therapies. Standard of care includes dietary and palliative measures. Currently, liver or kidney transplant is the only effective treatment.

mRNA-3704 is being developed as a chronically dosed mRNA therapeutic that directs cells in the liver to produce and express the MUT enzyme, restoring the metabolic pathway to reduce toxic metabolite build-up.

Year-to-Date Business Updates and Highlights

Financials as of June 30, 2017

Management Team Updates

Melissa Moore, Ph.D., elected to National Academy of Sciences: In May, Melissa J. Moore, Ph.D, Chief Scientific Officer of Moderna’s mRNA research platform, was elected to the National Academy of Sciences (NAS). Established in 1863, the NAS provides independent and objective advice to the US government and other organizations on matters related to science and technology. Election to membership in the NAS is widely considered one of the highest honors a scientist can receive. The NAS membership totals approximately 2,250 members and nearly 440 foreign associates, of whom approximately 200 have received Nobel prizes.

Juan Andres named Senior Vice President of Late Stage Technical Development and Manufacturing: In August, Moderna announced that Juan Andres joined Moderna as Senior Vice President of Late Stage Technical Development and Manufacturing. Mr. Andres previously served as Global Head Technical Operations (Manufacturing and Supply) at Novartis. Mr. Andres will be responsible for the scale-up of Moderna’s manufacturing, quality and operations efforts as it continues to advance its growing pipeline of mRNA medicines and prepares to bring its state-of-the-art Good Manufacturing Practice (GMP) mRNA clinical manufacturing facility online in 2018. In addition, he will lead efforts aimed at preparing Moderna for Phase 3 and commercial capabilities and capacity. Steve Harbin, who previously served as Senior Vice President of Manufacturing at Moderna, has transitioned to new roles as Chief of Staff and Chief Sustainability Officer.

Saqib Islam, Chief Business Officer, and James Kasinger, General Counsel and Secretary, depart Moderna: Mr. Islam and Mr. Kasinger have decided to pursue other opportunities. Mr. Islam will be departing the company in mid-September. Mr. Kasinger left Moderna earlier this year. A search to identify successors is underway.

Partner Updates

Moderna and Alexion terminate partnership: In July, Alexion announced its plans to conclude its partnership contract with Moderna, one of several actions undertaken by the company to reshape its R&D strategy. The ten product options that were part of the strategic agreement the two companies formed in 2014 were terminated, and the rights to development treatments for those rare diseases reverted to Moderna. While Alexion’s previously announced mRNA program in Crigler-Najjar syndrome type 1 (CN1) remains an area of research interest for Moderna, the company’s initial rare liver disease program in MMA is the current priority for development.

Operational Updates

R&D organizational update: Moderna has decided to move from its venture-based R&D model to a therapeutic area R&D model. Research/Preclinical Development will report to Moderna’s President Stephen Hoge, MD, and Clinical Development and Manufacturing, will report to Tal Zaks, MD, PhD, Moderna’s Chief Medical Officer. Research and development teams will be aligned around three core maturing therapeutic areas — infectious diseases, immuno-oncology and rare liver diseases. As Moderna advances parallel opportunities for mRNA vaccines and therapeutics into and through the clinic, a therapeutic area R&D model will enable Moderna to more effectively share clinical learnings across therapeutic areas. In addition, the continued evolution of Moderna’s platform coupled with the rapid cycle time in drug discovery will allow tighter integration between therapeutic area discovery teams and the platform R&D teams.

Moderna is not eliminating any headcount as part of the operational update. Moderna’s venture names and branding (Valera, Elpidea, Orkaido and Caperna) are being dissolved, with the entire organization moving forward under the corporate “Moderna” entity and brand.

Continued progress on Norwood GMP manufacturing facility build-out: To support and manage the breadth of simultaneous clinical studies Moderna anticipates in the coming years, the company is building a 200,000 square foot GMP mRNA clinical manufacturing facility in Norwood, Mass. The build-out continues to progress according to plan, and Moderna anticipates beginning operations at the Norwood facility in mid-2018.

The fully integrated facility will enable the manufacture, quality, control and supply of clinical grade mRNA therapies and vaccines for GLP toxicology studies as well as Phase 1 and Phase 2 clinical studies. Moderna will carry out all manufacturing activities at the site—from raw material production to APIs, formulation, filling and finishing.

Continued growth across organization: Since January 2017, Moderna added approximately 50 new team members and now has more than 550 team members.

Financials as of June 30, 2017
Maintained strong cash position: Moderna has maintained a strong cash position in 2017. As of June 30, 2017, the company had $1.098 billion in cash, as compared to $1.307 billion in cash as of December 31, 2016. This affords Moderna several years of runway to support its continued growth and pipeline acceleration.

Continued significant investments in the business: Moderna’s gross investment in the business in the first half of 2017 totaled $212 million in operating expense and capital expenditures. Net of reimbursements and product milestones, $183 million of cash was used for operating expense and capital expenditures.

About Moderna Therapeutics

Moderna is a clinical stage pioneer of messenger RNA (mRNA) therapeutics and vaccines, an entirely new drug technology that directs the body’s cells to produce intracellular or secreted proteins. With its breakthrough platform, Moderna is developing mRNA vaccines and therapeutics as a new class of medicines for a wide range of diseases and conditions, in many cases by addressing currently undruggable targets. Moderna is developing its innovative mRNA medicines for infectious diseases, cancer (immuno-oncology), rare liver diseases, cardiovascular diseases and pulmonary diseases, through proprietary development and collaborations with strategic partners.

Headquartered in Cambridge, Mass., privately held Moderna currently has strategic agreements with AstraZeneca, Merck and Vertex Pharmaceuticals, 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); and the Bill & Melinda Gates Foundation. To learn more, visit www.modernatx.com.

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