Data Published in *Nature Biotechnology* Show Messenger (m)RNA Prophylactic Vaccines Based on CureVac’s RNActive® Technology Demonstrate Immunogenicity and Protection Against Influenza Virus Infection

- RNActive Vaccine Technology Allows Fast Production in Response to a Pandemic Scenario
- RNActive Vaccines Are Stable at High Temperatures Which Makes Them Suitable for Easy Worldwide Supply
- RNActive Vaccines May Become a Novel, Broadly Applicable and Easy-to-Handle Prophylactic Class of Vaccine Against Infectious Diseases

**TUEBINGEN, Germany, Nov. 25** – CureVac GmbH, a clinical stage biopharmaceutical company developing a new class of therapies and vaccines based on mRNA, and the German Federal Research Institute for Animal Health, Friedrich-Loeffler-Institute (FLI), Germany, today announced that mRNA vaccines (RNActive) based on the company’s RNA technology platform have the potential to provide effective protection against infectious diseases. *In vivo* data published by CureVac and the Friedrich-Loeffler-Institute online in *Nature Biotechnology* show that mRNA vaccines induced balanced, long-lived and protective immunity to influenza A virus infections in various animal models. It is also shown that the production of RNActive vaccines is highly flexible. Thus, RNActive vaccines can be rapidly supplied for a variety of virus strains and subtypes identified in response to pandemic scenarios.

“The findings and results from a very fruitful collaboration with our colleagues from the renowned Friedrich-Loeffler-Institute, underscore the medical potential of mRNA beyond cancer immunotherapy and validate the capacity of our RNActive vaccines to prevent infectious diseases,” said Ingmar Hoerr, Ph.D., Chief Executive Officer of CureVac. “The synthetic nature
of our RNActive vaccines reduces production time dramatically and allows for sequence-matched vaccines that can be produced quickly and reliably in a scalable process. Additionally, our vaccines can be stored at room temperature, thereby avoiding the cold-chain in contrast to all other vaccines on the market and making worldwide distribution of our vaccines logistically and financially attractive."

Lothar Stitz, M.D., Head of Institute of Immunology, FLI, Greifswald, Germany, and one of the corresponding authors of the publication, said, "Our data highlight the potential and advantages of prophylactic mRNA-based vaccines and make immunization against a broad range of pathogens possible. We have a significant need for improved technologies that could be rapidly adapted to match circulating strains and allow efficient, large-scale production if necessary. In particular, we ultimately need a broadly protective vaccine against influenza. Thus, these mRNA vaccines overcome the drawbacks of many other prophylactic vaccination methods including DNA-based approaches that can have insufficient clinical efficacy or safety and may cause residual vector immunogenicity."

The authors demonstrated that the mRNA vaccine encoding full-length hemagglutinin (HA) of the influenza A/PuertoRico/8/1934 (PR8HA) strain was immunogenic and induced balanced B- and T-cell responses in mice. Influenza A viruses are classified based on the expression of a certain subtype of HA and a certain subtype of neuraminidase (NA). HA forms the basis of all licensed influenza vaccines. Furthermore, the immunized mice were protected against death and disease upon infectious challenge by an antibody-dependent mode-of-action. Moreover, the authors targeted additional influenza A virus strains by sequence-matched, HA-specific vaccines, and showed that all vaccines induced full protection against lethal infections, including H1N1pdm09 swine flu and H5N1 bird flu virus. The mRNA vaccine was immunogenic and provided long-term protection in newborn as well as in aged mice.

Additional data revealed that full protection was achieved upon single-dose immunization against influenza A/PR8 with a multi-component HA and NA mRNA vaccine. Furthermore, mRNA vaccines provided heterologous protection; vaccination with PR8 nucleoprotein (NP) mRNA led to protection against homologous PR8 (H1N1) or heterologous MB1 (H5N1) virus. Moreover, mRNA vaccines provided immunogenicity in ferrets, the animal model of choice for preclinical proof-of-concept studies in influenza research, and pigs compared to a licensed trivalent vaccine of corresponding specificity.
The publication, entitled ‘Protective efficacy of in vitro synthesized, specific messenger RNA vaccines against influenza A virus infection,’ was published online in Nature Biotechnology on Nov. 25.

**About RNAActive**

CureVac is combining both the antigenic and adjuvant properties of mRNAs to develop novel and effective mRNA vaccines. RNAActive vaccines are comprised of modified and formulated mRNA with three distinct features: The mRNA vaccines are translated into the target antigens, and the formulation and modifications lead to translatability ensuring (1) strong antigen expression, (2) increased stability and (3) enhanced immune-stimulatory activity.

**About CureVac**

CureVac is developing an entirely new class of therapies based on a fundamental new understanding of the medical potential of mRNA. Using its RNA technology platform, CureVac is currently developing novel therapeutic mRNA vaccines (RNAActive) for cancer and prophylactic vaccines for infectious diseases and adjuvants based on long, non-coding RNAs (RNAdjuvant®) for enhancing the immune response of other vaccines. The company has successfully completed Phase 1/2a studies with its RNAActive cancer vaccines in prostate cancer and non-small cell lung cancer (NSCLC). Results so far have shown that mRNA-based products are safe and capable of inducing balanced immune responses including humoral and cellular, Th1 and Th2 and effector and memory responses. In addition to developing its own pipeline, CureVac is collaborating with Sanofi Pasteur and In-Cell-Art on a $33.1 million project co-funded by Defense Advanced Research Projects Agency (DARPA) for the development of prophylactic vaccines in infectious diseases utilizing its RNAActive technology platform. For more information, please visit: [http://www.curevac.com](http://www.curevac.com).

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