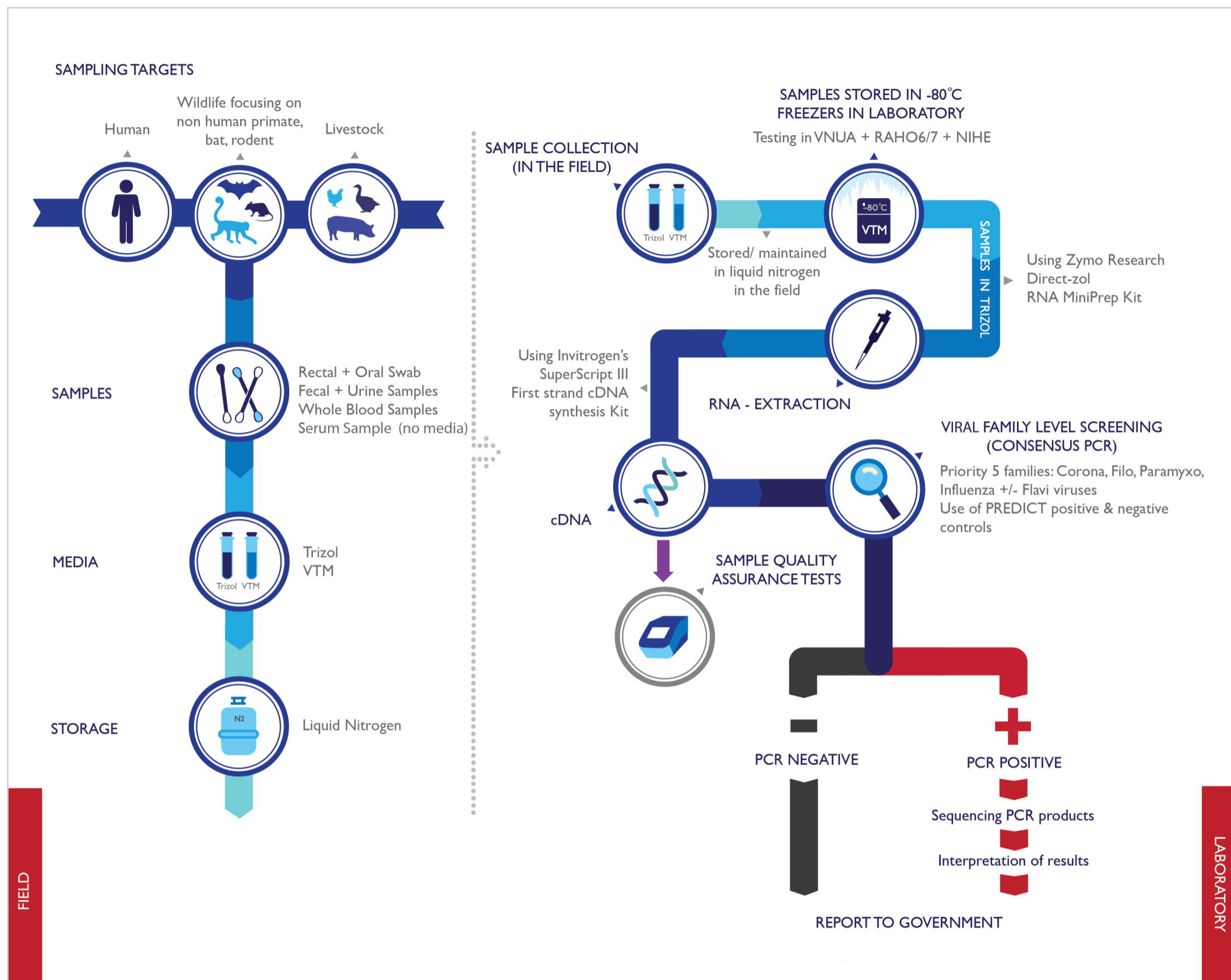Figure 1: A diagram of the PREDICT project sample collection and testing protocols from the field to the laboratory.

PREDICT is the first project to use consensus polymerase chain reaction (cPCR) as the primary method for detection of both known and novel viruses in a wide range of samples and host species on a global scale (Goldstein et al. 2013; Anthony et al. 2013). The advantages of this approach include:

• An inexpensive testing method (cPCR) run on basic equipment, such as thermal cyclers for conventional PCR already available in animal and human health laboratories in Viet Nam and globally.

• The "universal" amplification of viruses within a given viral family or genus.

• Synthetic 'universal controls' that provide standarized control material without any danger of pathogen transmission.

• Increased safety to laboratory workers as any microbes in the samples are killed during the PREDICT nucleic acid extraction steps so laboratory workers are not exposed to dangerous pathogens.

• Ability to extend the PREDICT diagnostic strategy beyond the detection of viruses in wildlife to the diagnosis of mystery illnesses in medical hospitals or in solving an unknown disease outbreak in livestock or domestic animals.

Anthony, S.J., J.H. Epstein, K.A. Murray, I. Navarrete-Macias, C.M. Zambrana-Torrelio, A.Solovyov, R.Ojeda-Flores, N.C.Arrigo, A. Islam, S.Ali Khan, P. Hosseini, T.L. Bogich, K.J. Olival, M.D. Sanchez-Leon, W. Karesh, T. Goldstein, S.P. Luby, S.S. Morse, J.A.K. Mazet, W.I. Lipkin, and P. Daszak. 2013a. A strategy to estimate unknown viral diversity in mammals. mBio 4(5):doi:10.1128/ mBio.00598-13.

Goldstein, T., S.J.Anthony, B.Schneider, D.Joly, W.B.Karesh, P. Daszak, A. Clements, D. Carroll, and J.A.K. Mazet. 2013. Using a conventional strategy to develop a new paradigm for novel virus detection and building capacity to implement globally. A World United Against Infectious Diseases: Cross-sectoral solutions. Prince Mahidol Award Conference. Bangkok, Thailand. January 28 – February 2, 2013.

HIGHLIGHT:

Strengthening diagnostic capacity in Viet Nam for detection of known and novel viruses of pandemic potential to predict and prevent disease emergence

The frequency of epidemics, like SARS, pandemic influenza, MERS, Ebola, and Zika virus, are increasing. As the human population has grown, people and their domestic animals have had increasing contact with wildlife through increased hunting and trade of wildlife species, and encroachment into forests and other wildlife habitats. The increased contact, environmental change, and globalized trade and travel are driving the transmission of viruses and other potential pathogens. Predicting and preventing the emergence of pathogens of pandemic potential requires an understanding of the viruses circulating in wildlife and the practices and behaviors that drive the spillover and sharing of viruses among wildlife, domestic animals, and humans. PREDICT has optimized molecular diagnostic protocols for viral detection that can be applied across sample types and species. The project aims to build capacity in national animal health and public health laboratories for early detection of novel viruses. Data collected through this approach will identify and characterize viruses of pandemic potential and inform our understanding of the drivers of disease emergence so that prevention and mitigation measures can be put in place.

Capacity Building

PREDICT worked with the National Influenza Centers (NIC) Laboratory system in Viet Nam to provide training on the application of PREDICT protocols for novel virus detection. The first teleconference between PREDICT laboratory leads and the heads of the NICs of the National Institute of Hygiene and Epidemiology (NIHE) and Pasteur Institute Ho Chi Minh (PI-HCMC) was held on October 7, 2016.

Photo 1: Training at the National Institute of Hygiene and Epidemiology on the application of PREDICT protocols for novel virus detection. Photo credit: WCS Viet Nam

Surveillance and Field Activities

PREDICT continued to collect samples from wildlife confiscated from the illegal wildlife trade as part of surveillance for viruses of pandemic potential along the wildlife trade animal value chain. This quarter PREDICT investigated morbidity and mortality reports in non-human primates.

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Laboratory Development/Testing

• The main PREDICT partner laboratories in Viet Nam include the Regional Animal Health Office No. 6 (RAHO6), NIHE, and Viet Nam National University of Agriculture (VNUA). Additional partner laboratories include RAHO7 and PI-HCM. Diagnostic protocols and the PREDICT synthetic Universal Positive Control (UPC) were provided to the laboratories and testing of samples is on-going. PREDICT-2 has prioritized building laboratory capacity for the detection of Paramyxoviruses, Coronaviruses, Flaviviruses, Filoviruses, and Influenza viruses:

    o NIHE is currently putting testing in place for the 5 PREDICT priority viral family consensus PCR protocols.

    o VNUA is currently using PREDICT protocols to test 196 wildlife samples from animals confiscated from the illegal wildlife trade.

    o Further characterization of novel coronaviruses viruses detected in Viet Nam during PREDICT-1 is underway at PREDICT global laboratories.

Stakeholder Engagement and Partner Coordination

• The Ministry of Health officially approved NIHE as an implementing partner of PREDICT-2 in Viet Nam on November 9, 2016.

• PREDICT shared project experience related to submission of biological samples to laboratories and sharing of diagnostic data at a "Technical symposium for sharing study experience on zoonosis diseases between central public health laboratories and veterinary laboratories" organized by the National Institute of Hygiene and Epidemiology (NIHE).

• PREDICT reviewed and provided inputs on a draft of a handbook on wildlife farm management at a meeting convened by the Convention on International Trade in Endangered Species of Wild Fauna and Flora Management Authority (CITES MA) of on Viet Nam. The meeting was held in Ha Noi on December 23, 2016.

PREDICT partners in Viet Nam:

• Department of Animal Health, Ministry of Agriculture and Rural Development (MARD)
• National Institute of Hygiene and Epidemiology (NIHE), Ministry of Health (MoH)
• Viet Nam National University of Agriculture (VNUA)
• Regional Animal Health Office No. 6 (RAHO6)