



mRNA Technology Transfer Programme

MPP HELPS TO ENSURE LONG-TERM REGIONAL HEALTH SECURITY

The COVID-19 pandemic underscored the gross inequity that exists with global access to health products, especially vaccines. The ubiquity and costs of the COVID-19 pandemic have finally focused attention on equitable access and created an opportunity to invest in long-term regional health security.



The mRNA Technology Transfer Programme

Was set up to address the inequalities in access to vaccines in low- and middle-income countries that emerged during the COVID-19 pandemic.

The objectives of the Programme are to establish and enhance sustainable mRNA vaccine manufacturing capacity and to develop skilled human capital in the regions where mRNA vaccine manufacturing capacity is limited or non-existent. The programme is based around a technology transfer “hub” Afrigen, which is located in South Africa.

01 15 PARTNERSHIPS ESTABLISHED ACROSS THREE CONTINENTS

By the end of the year, the Programme had secured the partnership of 15 manufacturing companies from low- and middle-income countries drawn from Africa, Europe, Asia and Latin America, all of whom had expressed their interest to WHO in participating in the mRNA Programme.



Technology transfer agreements have been signed with 13 of these partners. By December 2022, nine of the 15 manufacturing partners had received hands-on introductory training on the mRNA technology at Afrigen in Africa.

This training was completed by 44 attendees from nine different countries, of whom 17 were women.

02 mRNA MANUFACTURING PROCESS NOW SUCCESSFULLY MAPPED OUT

The equipment for manufacturing and testing the COVID-19 mRNA-based vaccine at 1L in-vitro transcription (IVT) scale was successfully installed in 2021. As a result, the mRNA manufacturing process has now been successfully mapped out.

Afrigen has since compiled a document, technology transfer package 1a, describing the GMP vaccine manufacturing facility layout, personnel and material flows, preliminary process flow charts, and the equipment and materials required for manufacturing drug substance and drug product for the Phase I/II clinical trial. These documents form a pre-cursor package to the final tech transfer package 1, which will be updated as part of the process towards the manufacturing of two technical batches and the engineering batch.



03 LABORATORY MANUAL FOR mRNA COVID-19 VACCINE PREPARATION AT SMALL SCALE

Afrigen drew up and distributed a laboratory manual for the preparation of the mRNA COVID-19 vaccine at laboratory small scale. This includes a description of the plasmid design, the manufacturing process – starting from plasmid linearisation and up to lipid nanoparticle formulation – the laboratory layout, the list of necessary equipment and raw materials, as well as the description of analytical methods deployed for drug substance and drug product characterisation. The manual has been distributed to all partners signing a technology transfer agreement, as well as those receiving the introductory training.

04 SAMVAC ESTABLISHED TO ENABLE VACCINE PIPELINE DEVELOPMENT

In January 2022, MPP's partner, the South African Medical Research Council (SAMRC), established the South African mRNA Vaccine Consortium (SAMVAC). This included various institutions responsible for the development of a second-generation improved mRNA technology platform – which would reduce the cost of goods, improve thermostability, increase yields and freedom to operate – and a vaccine pipeline salient for Africa novel mRNA vaccine candidates for SARS-CoV2 and other diseases for low- and middle-income countries.

The SAMRC has also now successfully concluded nine funding agreements with several institutions and transferred funds for Year 1 of the programme to begin; in January 2022 a research commercialisation agreement was also executed between all SAMVAC members.

05 ACHIEVEMENTS ON THE ROAD TO NEW VACCINE CANDIDATES

There have been several stand-out achievements towards the optimisation of the technology and the early development of new vaccine candidates:

- ✓ New lipids have been synthesised and successfully tested for their ability to form lipid nanoparticles with the desired characteristics
- ✓ New constructs with SARS CoV-2 Omicron variants have been generated and tested in proof-of-concept immunogenicity studies
- ✓ Both a TB and HIV project have been initiated (antigen discovery and vaccine development)

06 FUNDS SECURED FOR SOUTH AFRICAN CONSORTIUM AND LOCAL MANUFACTURING

The mRNA Technology Transfer Programme has received exceptional support from high-income countries and South African organisations. At the end of 2022, \$US 122 million had been confirmed and USD 112 million had already been received to fund activities linked to the South African consortium (73 per cent) and Programme Partners (27 per cent). Funds have been raised both to fully cover SAMVAC's expenditure for the technology platform development and to partially cover expenditure linked to initial preparatory activities at Programme Partner sites. These preparatory activities include the procurement of critical equipment for mRNA vaccine manufacturing, site assessments, the development and strengthening of local regulatory capabilities, and bio-manufacturing training.

07 NEWLY-CREATED SCIENTIFIC ADVISORY COMMITTEE ADDS TECHNICAL EXPERTISE

In October, the mRNA Scientific Advisory Committee (mSAC) was established to provide technical support for the programme. Meeting twice a year, this independent group, which draws on a wealth of expertise from the public and private sectors of all continents, will advise MPP and the mRNA Programme Partners about any scientific matters that may arise and reports to MPP's Executive Director.

The mSAC currently consists of eight members. Experts bring experience from WHO, the Perelman School of Medicine, the University of Pennsylvania, Chulalongkorn University Vaccine Research Center, the National Institute of Allergy and Infectious Diseases Vaccine Research Center, Sanofi Pasteur, Wellcome Leap and Moderna.

FOCUS ON PARTNERSHIP: LATIN AMERICAN MANUFACTURERS COMPLETE FIRST TRAINING AT mRNA TECHNOLOGY TRANSFER PROGRAMME

In March 2022, scientists from two vaccine manufacturing companies from Argentina and Brazil were the first to receive technology transfer training at Afrigen. A group of scientists from Argentina's Sinergium Biotech and Brazil's Bio-Manguinhos/Fiocruz travelled to the Hub at Afrigen, Cape Town.

In a three-day course, they learned about Afrigen's lab-scale mRNA manufacturing process, including formulation of lipid nanoparticles and data analytics, as well as the production and control of vaccines using mRNA technology.



The benefit of this programme is enormous. This programme enables countries to develop and produce mRNA vaccines in their own countries and cover the supply of vaccines where they are needed the most. A lot of big pharmaceuticals refuse to do a tech transfer, specifically of this technology. We saw with COVID-19 that not all countries have equal access to vaccines.

SOTIRIS MISSAILIDIS RESEARCH AND DEVELOPMENT DIRECTOR AT BIO-MANGUINHOS/FIOCRUZ, A RIO DE JANEIRO PUBLIC HEALTH INSTITUTION THAT MANUFACTURES VACCINES FOR YELLOW FEVER AND MENINGOCOCCAL DISEASE FOR BRAZIL AND OTHER LATIN AMERICAN COUNTRIES

The mRNA technology transferred from the Programme will allow companies to manufacture vaccines not only against COVID-19, but against other diseases, including flu and respiratory viruses. There is a huge field to explore in mRNA technology."

SANCHEZ ALBERTI A PROJECT MANAGER AT SINERGIUM, A PRIVATE SECTOR BIOPHARMACEUTICAL COMPANY OUTSIDE BUENOS AIRES WHICH MANUFACTURES VACCINES FOR ARGENTINA AND THE REGION



Other companies that have been selected as partners include Biovac from South Africa, African manufacturers from Egypt, Kenya, Nigeria, Senegal and Tunisia, and manufacturers from Bangladesh, India, Indonesia, Pakistan, Serbia, Ukraine and Vietnam.

"The WHO mRNA Technology Transfer Programme is a great opportunity for IPD because it is clearly aligned with our "raison d'être" of accelerating equitable and sustainable access to health. For 80 years, IPD has been manufacturing yellow fever vaccines that meet WHO standards for vaccine quality. We are now ready to leverage this experience and take the next step in our journey by expanding our portfolio. As a partner with the vision to "manufacture vaccines for equity" the mRNA technology represents a great opportunity for at least four reasons:

- Connecting surveillance and manufacturing to accelerate the process between detection of new pathogens and response with an appropriate vaccine
- mRNA technology-based Research and Development: We are in discussions with partners to address Africa's need for vaccines. Our objective is to build internal capacity and to help develop a portfolio relevant in the long term
- Human capital development: IPD has already significantly strengthened its team by recruiting brilliant young scientists whose extensive backgrounds in infectious disease are already being leveraged to undertake disease surveillance and research
- Technology transfer: An amazing value-add of the hub programme is the sharing of knowledge and know-how that will take place amongst partners

DR AMADOU ALPHA SALL IS THE GENERAL ADMINISTRATOR INSTITUT PASTEUR DE DAKAR (IPD), SENEGAL

