mRNA Technology Transfer Hub Programme

BioGeneric Pharma S.A.E.

Presentation Content

1 Overview about BioGeneric Pharma “BGP”

2 Production capabilities & Capacities

3 Products and Pipeline

4 mRNA TT project status at BGP

Overview

BioGeneric Pharma "BGP" is an Egyptian private company with multi-national shareholders:

Egyptian Private Investors

Pharco Corporation

"Ranked No. 1 in the Egyptian market in 2019"

Saudi Private Investors

Amoytop Biotech China

"Listed in the Stock Market"

BioGeneric Ltd. USA

mRNA Technology Transfer Hub Programme

Vision – Mission – Policy

Integrated Quality Management System

To provide high quality therapeutic biopharmaceutical products and preventive vaccines for saving lives

To become a leading biopharmaceutical company in development & production of therapeutic biological products and preventive vaccines

BGP Policy

mRNA Technology Transfer Hub Programme

BGP

Issue No.:	01
Issue Date:	14/11/2021
Effective date:	12/2021
Revision date:	2026

BioGeneric Pharma S.A.E

Integrated Quality Management System Policy

Sys-PY01

BioGeneric Pharma S.A.E (BGP) as an international, new state of the art biopharmaceutical corporate firmly commits to operate *Integrated Quality Management System* in accordance with the requirements of ISO9001:2015, ISO14001:2015, ISO45001:2018, PAS 99: 2012, international standards of cGMP in compliance with US FDA, EMA and WHO requirements, contractual requirements, applicable regulations and other requirements.

BGP is considered to be a world class biological production facility that operates under global regulatory, quality and safety standards guaranteeing products' quality accompanied by an environment-friendly production and testing system and providing a safe workplace.

BGP's aim is to develop, manufacture, analyse and market biopharmaceutical drug products and preventive vaccines in a consistent affordable price all the way through products' life cycle, focusing on continual improvement through programs appropriate to the nature and scale of risks and aspects and ensuring customer satisfaction, preservation of the environment; avoiding pollution, injury and ill health and complying with laws, regulations and other requirements.

BGP is built on an experienced team of experts from various areas of biotechnology and quality capable of facing any challenges that may occur within the fast growing biotech field.

BGP believes in the diverse contributions of employees and provides extra ordinary value to the customers, community, shareholders and other relevant interested parties.

Dr. Mohamed R. Sayed
CEO BioGeneric Pharma S.A.E

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BGP Production Capabilities & Capacities

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Brief overview on drug substance production areas' capabilities

- **Mixers (50 L to 1500 L)**
- **Tissue culture flasks up to 2000 ml**
- **Bioreactors from 25 L to 2000 L**
- **Clarification systems with depth filters up to 20 m²**
- **Single-use dual chromatography/TFF systems up to 3600 L/h**
- **Systems for the final drug substance filtration up to 2.0 m²**

All equipment operate via single use technology & are supplied by PALL®

Formulation and Filling Line (Robotic 3 Lines in 1; Vial, Cartridges and Pre-filled syringes):

Constructed on 850 m²

Pre-formulation, formulation, filtration and filling by using single use technology, supplied by Syntegon® and single use formulation tanks supplied by Merck®

Container	Working Capacity/Hour
Pre-filled Syringe	7,536
Cartridge	5,472
6R Vial	4,032
20R Vial	2,120
50R Vial	1,120

Formulation and Filling Conventional Vial Line:

Constructed on 650 m²

Pre-formulation, formulation, filtration and filling with 300 L and 600 L pre-formulation tanks and 600L sterile receiving tank supplied by Syntegon®

Container	Working Capacity/Hour
2R Vial	19,200
6R Vial	16,000
10R Vial	13,824
20R Vial	8,208
50R Vial	3,072

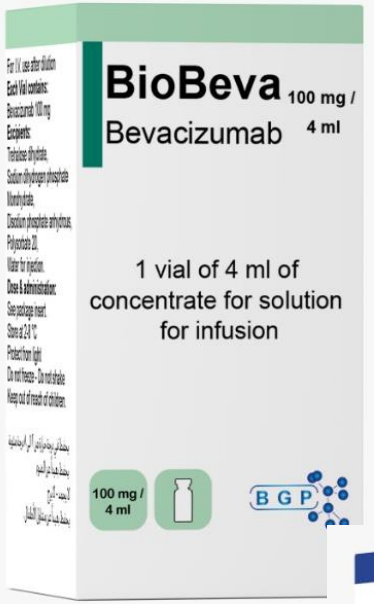
Brief overview on inspection, labelling and packaging capabilities

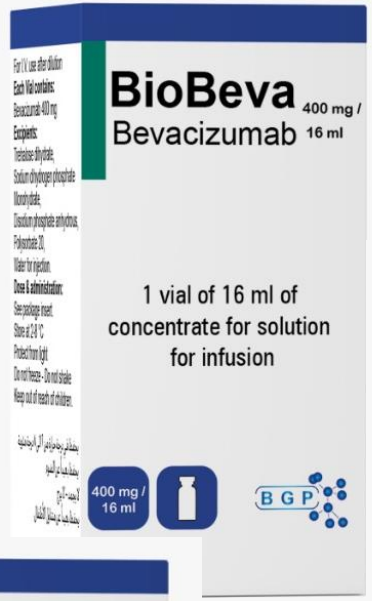
Automatic visual inspection machine & 2ry packaging line with track & trace system supplied by Syntegon®

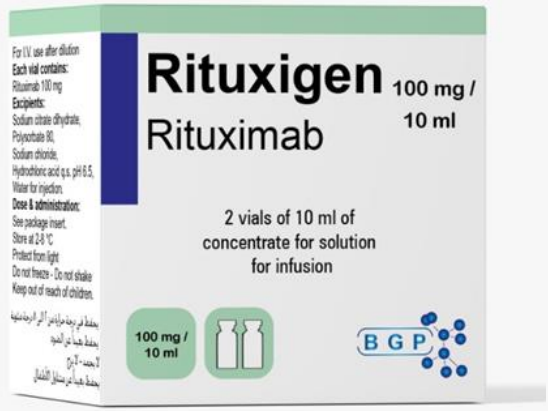
Used for vials, syringes & cartridges.

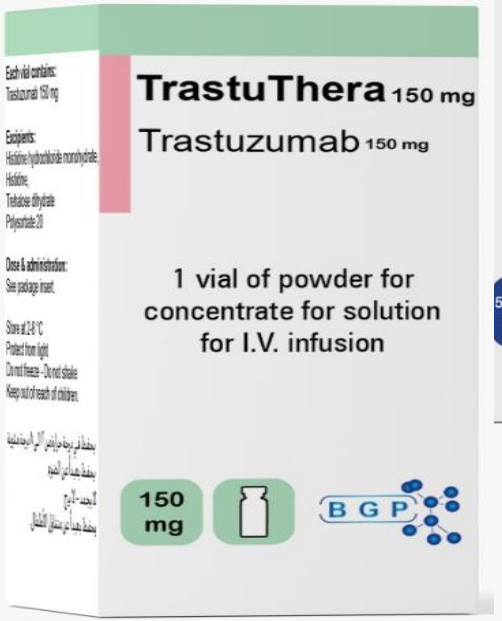
Capacity of 2ry packaging line is around 100 cartoon/minute

Products' Overview









Approved products

Trade Name	Generic Name	Concentration	Dosage Form	Pack
BioBeva	Bevacizumab 25 mg/ml	100 mg/4 ml	Concentrate for solution for I.V. infusion	Single-dose vial of 4 ml
		400 mg/16 ml		Single-dose vial of 16 ml
Rituxigen	Rituximab 10 mg/ml	100 mg/10 ml	Concentrate for solution for I.V. infusion	2 Single-dose vials of 10 ml
		500 mg/50 ml		Single-dose vial of 50 ml
TrastuThera	Trastuzumab	150 mg	Lyophilized Powder for concentrate for solution for I.V. infusion	Single-dose vial of 150 mg powder
		440 mg		Multi-dose vial of 440 mg powder + 20 ml vial of bacteriostatic WFI
Finlimod*	Fingolimod	0.5 mg	Hard Gelatin Capsules	Pack of 28 capsules

* Toll manufactured

Under registration products

Insulins			
Trade Name	**Generic Name**	**Dosage Form**	**Pack**
Biogensulin R Vial	Insulin regular	Solution for S.C.&I.V. injection	Multi-dose vial
Biogensulin R Cart	Insulin regular	Solution for S.C. injection	Cartridge
Biogensulin Mix	Human Insulin 30/70	Suspension for S.C. injection	Multi-dose vial
Biogensulin Mix Cart	Human Insulin 30/70	Suspension for S.C. injection	Cartridge
Genupart	Insulin aspart	Solution for S.C.&I.V. injection	Multi-dose vial
Genupart Pen	Insulin aspart	Solution for S.C. injection	Pre-filled disposable pen
Genupart Cart	Insulin Aspart	Solution for S.C. injection	Cartridge
Genupart Mix	Insulin Aspart biphasic	Suspension for S.C. injection	Cartridge
Genupart Mix Pen	Insulin Aspart biphasic	Suspension for S.C. injection	Cartridge
Glarsulin	Insulin glargine	Solution for S.C. injection	Multi-dose vial
Glarsulin Pen	Insulin glargine	Solution for S.C. injection	Pre-filled disposable pens
Glarsulin Cart	Insulin glargine	Solution for S.C. injection	Cartridge

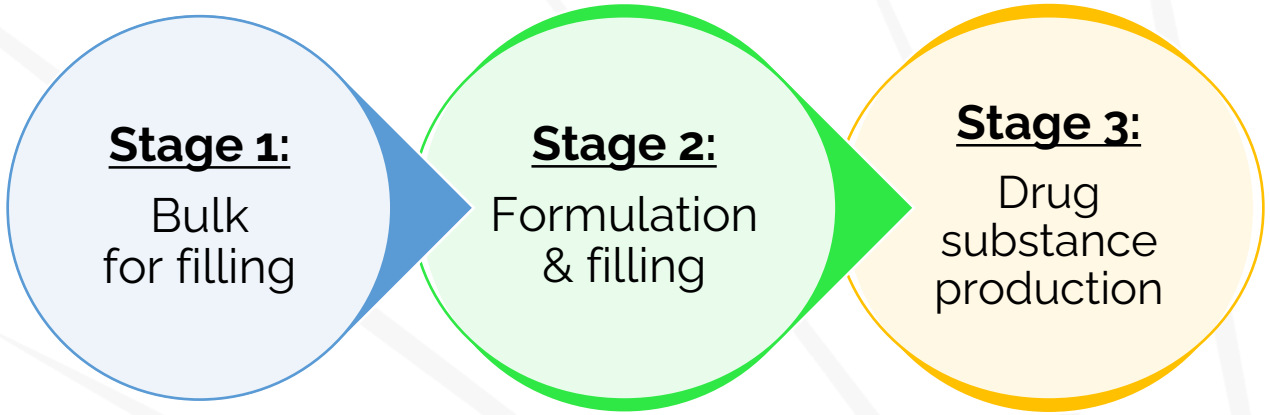
Under registration products (Continued)

Trade Name	Generic Name	Concentration	Dosage Form	Pack
Filgrastim				
Biofilgragen	Filgrastim	300 mcg/ml	Solution for S.C, I.V injection & Infusion	Single-dose vial of 1 ml solution
Biofilgragen PFS	Filgrastim	300 mcg/0.5 ml	Solution for S.C. injection	PFS of 0.5 ml solution
Enoxaparin	Enoxaparin sodium	20 mg/0.2 ml 40 mg/0.4 ml 60 mg/0.6 ml 80 mg/0.8 ml	Solution for injection	PFS of 0.2 ml solution PFS of 0.4 ml solution PFS of 0.6 ml solution PFS of 0.8 ml solution
Inactivated Poliomyelitis Vaccine, Sabin Strains (Vero Cell)	Each 0.5 ml dose contains: Type I (Sabin) 15 DU Type I (Sabin) 45 DU Type I (Sabin) 45 DU		Suspension for injection	Single-dose vial Multi-dose vial

Products (Continued)

Technology Transfer Multi-stage Projects:

- Monoclonal antibodies
- Vaccine products

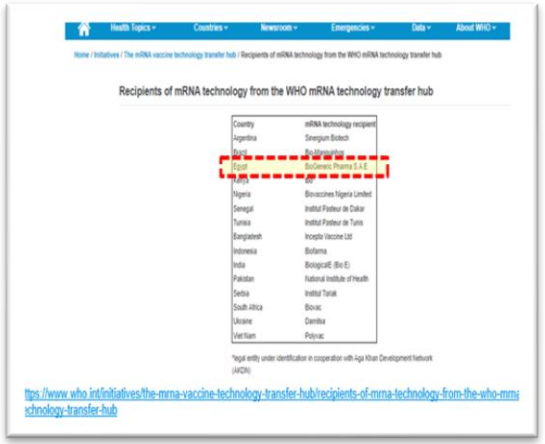


Local Production "Formulation & Filling"

- Fingolimod
- Filgrastim
- Enoxaparin
- Insulin products & analogues "Full-range portfolio"

mRNA Technology Transfer Programme current status at BGP

Visits from WHO/MPP to BGP



Feb - 2022

WHO announcement

June - 2022

- WHO Headquarter (PQ Team & LPA Unit)
- WHO RO "EMRO"
- WHO CO "Egypt"
- EDA

October - 2022

Director general of WHO "Dr. Tedros Adhanom"

H.E. Egyptian Minister of Health

Jan - 2023

- MPP
- WHO Headquarter
- WHO RO "EMRO"
- WHO CO "Egypt"
- EDA

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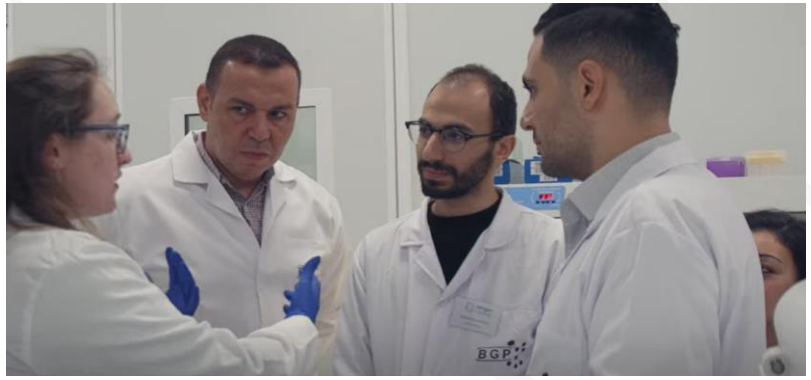
mRNA Activities Classification at BGP



mRNA activities classification

- COVID-19
- Non COVID-19

1	Training on lab-scale mRNA technology at Afrigen in August 2022	Done
2	Document received regarding introduction to mRNA Technology in December 2022	Done
3	Gap analysis has been performed by BGP team to identify the needed equipment and tools	Done
4	Received TT Package 1a on 04/04/2023, and started gap analysis	Ongoing
5	Preparation for receiving the pilot/commercial scale from the mRNA hub in South Africa	Waiting

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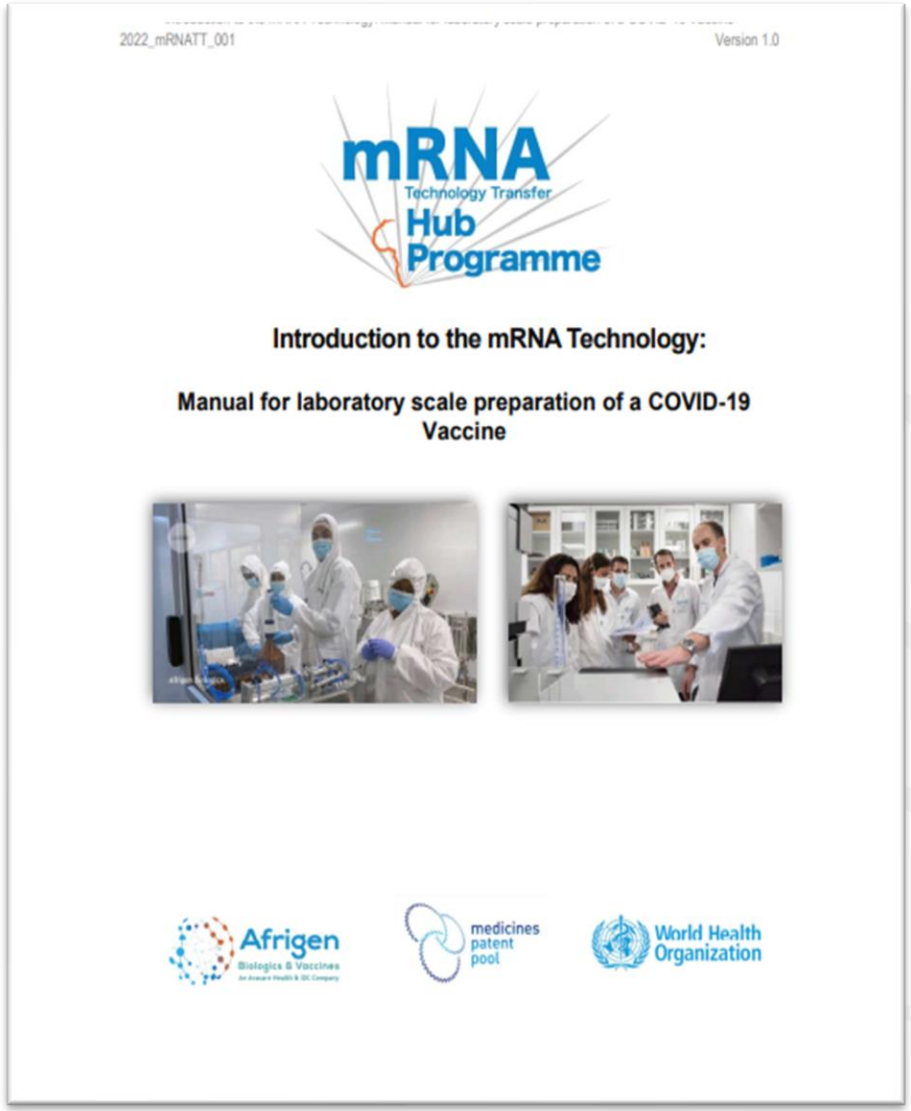
Documents received regarding introduction to mRNA Technology on 04/12/2022



2022_mRNATT_001 Version 1.0

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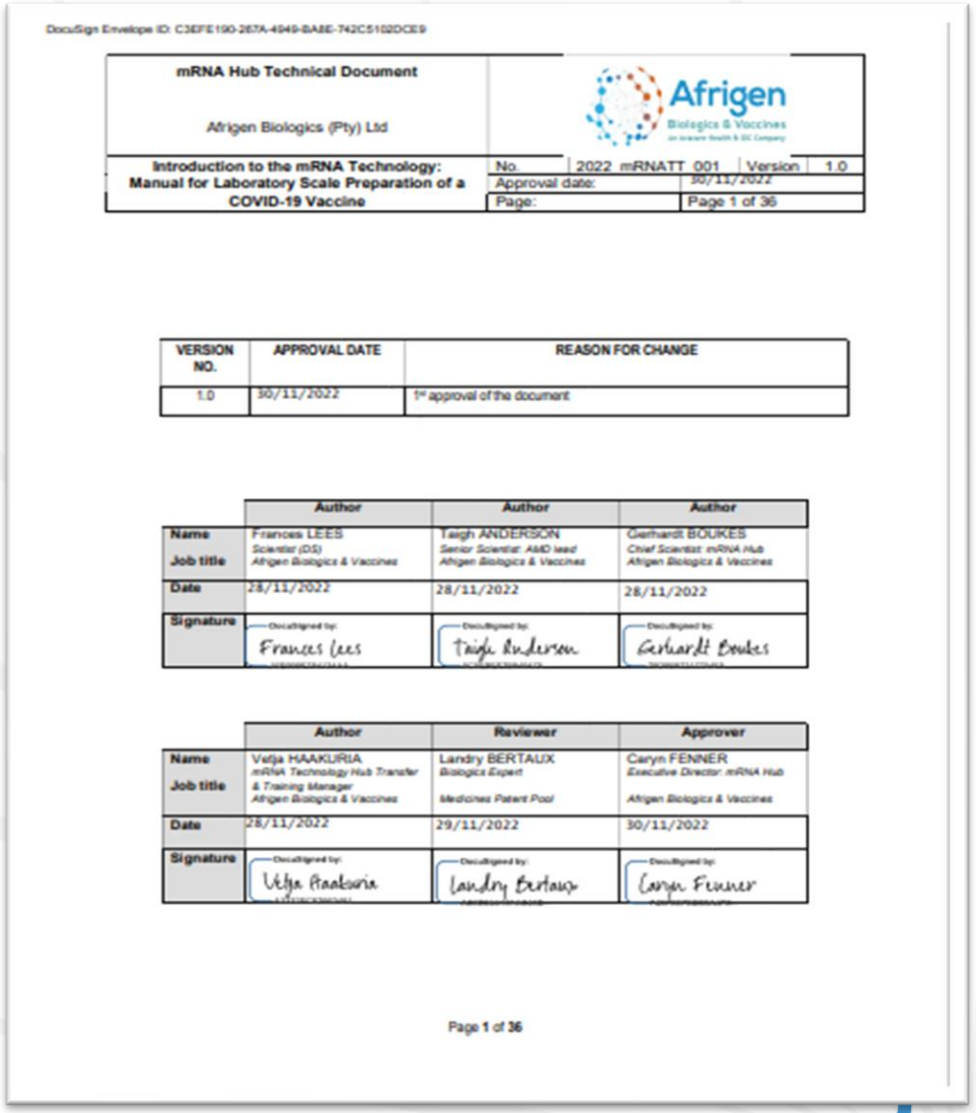
Introduction to the mRNA Technology:

Manual for laboratory scale preparation of a COVID-19 Vaccine

Afrigen Biologics & Vaccines

medicines patent pool

World Health Organization



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mRNA Hub Technical Document Afrigen Biologics (Pty) Ltd		
Introduction to the mRNA Technology: Manual for Laboratory Scale Preparation of a COVID-19 Vaccine	No. 2022_mRNATT_001 Version 1.0 Approval date: 30/11/2022 Page: Page 1 of 36	

VERSION NO.	APPROVAL DATE	REASON FOR CHANGE
1.0	30/11/2022	1st approval of the document

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	Author	Reviewer	Approver
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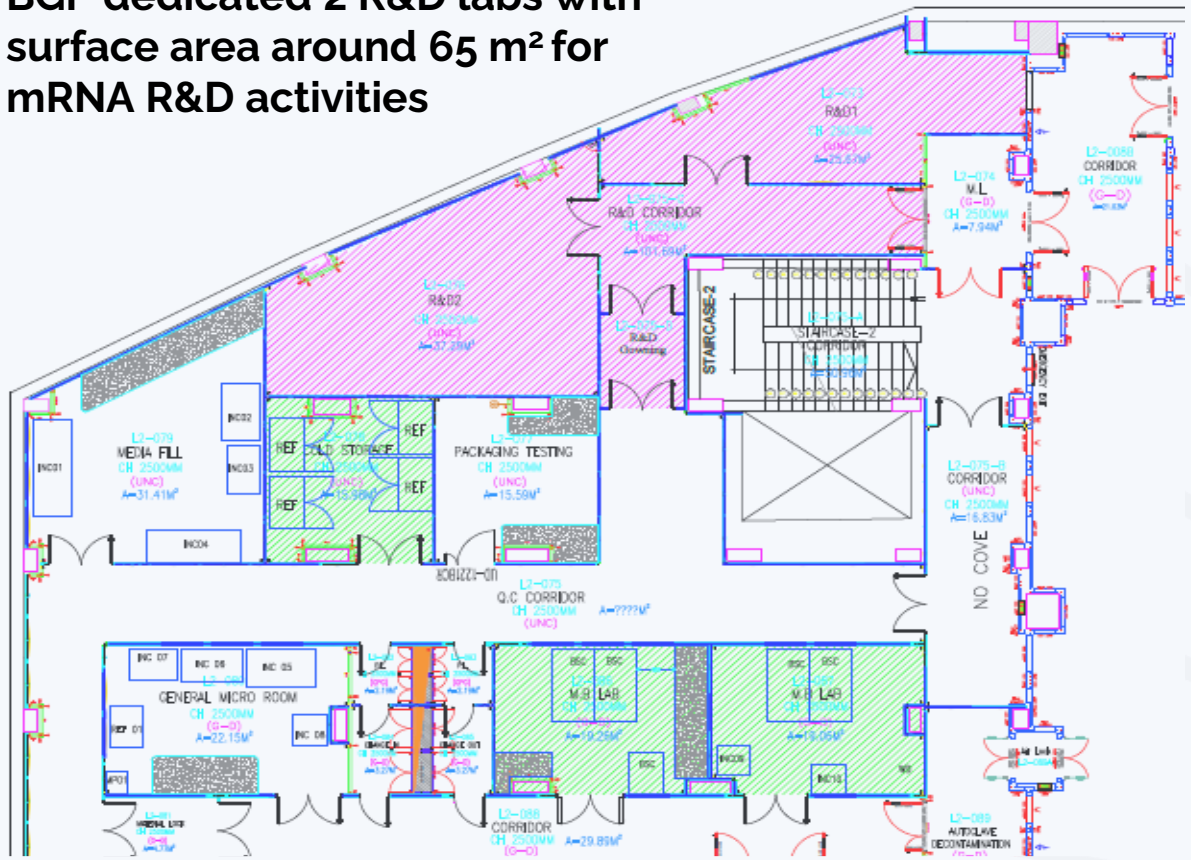
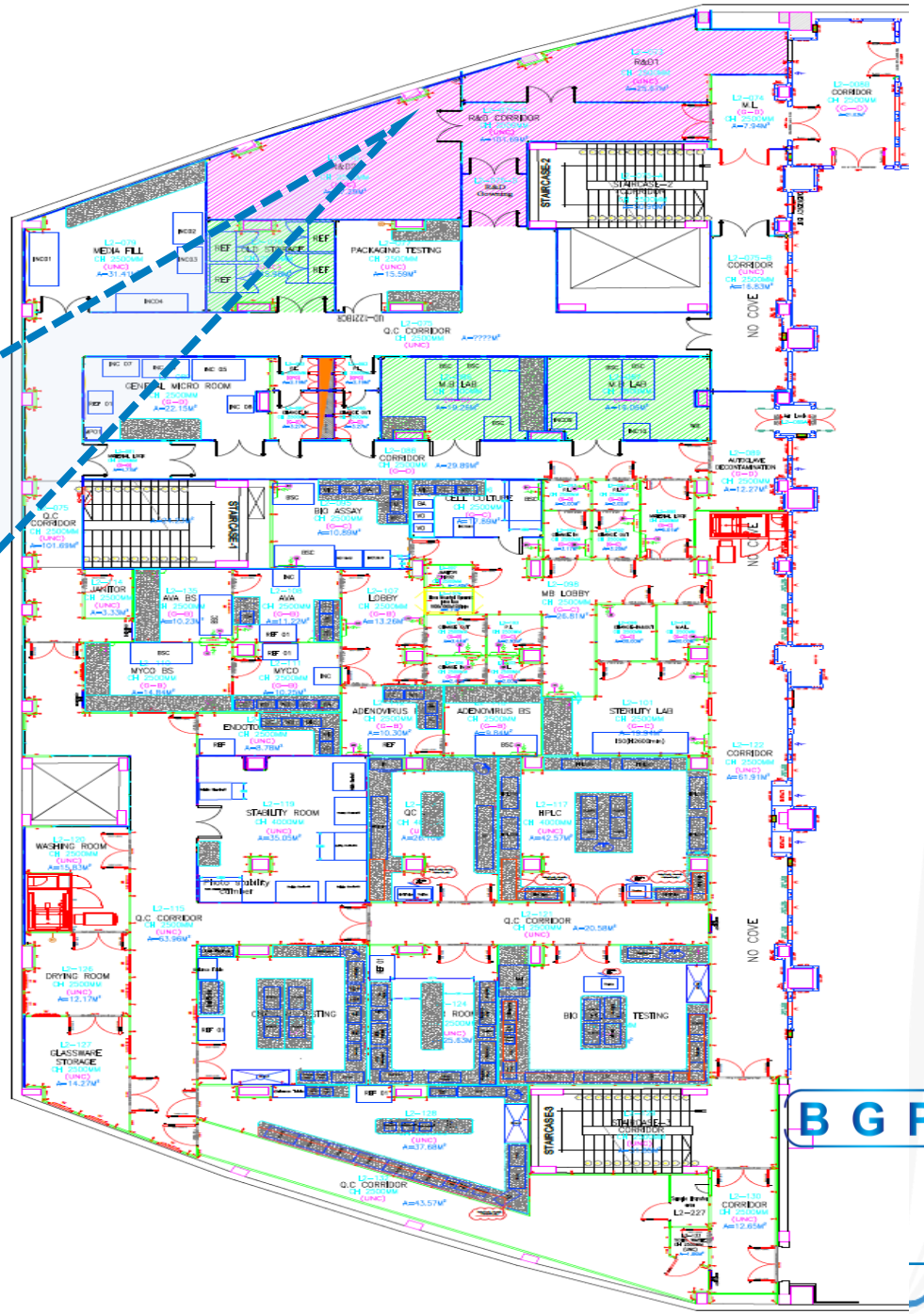
Labs dedicated for mRNA R&D activities

BGP dedicated 2 R&D labs with surface area around 65 m² for mRNA R&D activities





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BGP

Gap Analysis with reference to introductory package

	Gap analysis evaluation form Sys-P007 – Attachment C	Issue No.: 01 Issue Date: 15/03/2022

Serial no.: *GAP-002* **Issue No.:** *01* **Issue date:** *05/01/2023* **Revision date:** *2026*

Title: *Gap analysis for R&D lab scale process of COVID-19 mRNA project with WHO against current state at BGP*

Description of gap analysis project: *This gap analysis project is based on the document received from WHO on 04/12/2022 regarding introductory package for R&D Lab-scale process steps for the production of COVID-19 mRNA vaccine (attachment A).*

After document review by the mRNA technical team, it was decided to perform gap analysis between the available equipment at QC labs and those required for R&D scale. Details are as mentioned below:

Reference	Requirement	Current state	Gap identified		Description of identified gap (if applicable)	Action needed	Responsibility	Due date
			Yes	No				
Introduction to the mRNA Technology: *Manual for Laboratory Scale Preparation of a* *COVID-19 Vaccine no. 2022_mRNATT_001, version 1* *Item no. 3 R&D Lab-scale process steps for the production of COVID-19 mRNA vaccine* *Attachment A*	*Equipment, materials and consumables required for R&D Lab-scale process steps for the production of COVID-19 mRNA vaccine* *Refer to attachment B*	*Equipment, materials and consumables available at BGP that can support R&D lab scale process for the production of COVID-19 mRNA vaccine* *Refer to attachment B*	√	---	*Refer to attachment B*	*Refer to attachment B*	*QC department*	*Q2/Q3-2023*

Conclusion: *Upon performing gap analysis for equipment, materials and consumables required for R&D Lab-scale process steps for the production of COVID-19 mRNA vaccine, some gaps were identified. Most suppliers for missing equipment/materials/consumables were contacted for financial offers as shown in attachment B. For remaining items, suppliers are being contacted to fill in gaps. Change will be reported and assessed in a change control to approve and start implementation.*

	Prepared by	Revised by:	Approved by
Name/Title:	*Nourhan Hassan* *QC Department Manager*	*Eva Nabil* *QA Department Manager*	*Fawzi Hassan* *Quality Director*
Signature/Date:			

	GAP-002 – Attachment B	Issue No.: 01 Issue Date: 05/01/2023 Editor: QC department

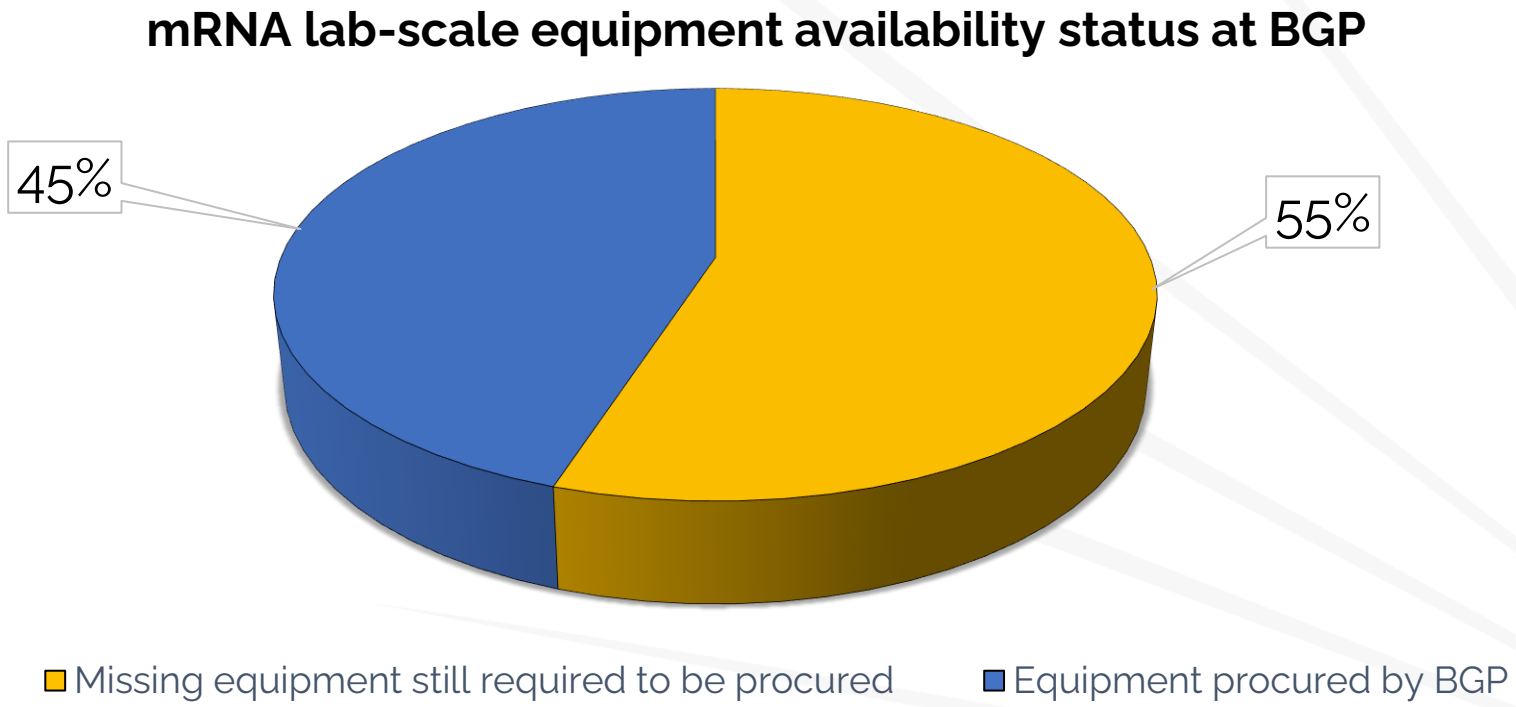
rements to support mRNA project

m / location	Intended use	Recommended suppliers by WHO	Status	Price/date/supplier Not include VAT	Comments
Equipment					
' cleaner Box	- pDNA linearization - In vitro Transcription (IVT) and LiCl precipitation - Capping and LiCl precipitation - In process assays - Batch testing	BioSan (UVT-S-AR)	☐ available in BGP ☒ need to be purchased	**232,900 EGP = 9421.54 USD** (BioSan, 12/22)	BGP has already this item in the QC labs but separate one could be needed for R&D
quired in R & D labs					
l 3500XL Genetic alyzer	- pDNA sequence identification and verification. - In vitro Transcription (IVT) and LiCl precipitation - In process assays - RNA sequencing and identification - mRNA identification	Thermo fisher	☐ available in BGP ☒ need to be purchased		Waiting for supplier quotation (The suppliers will provide the quotation price after Christmas vacation).
ll be located in QC labs R lab					
nchtop Cooling ntrifuge	- pDNA linearization	Hettich (Rottina 420R)	☐ available in BGP	**470,480 EGP**	BGP has already this item in the QC labs but

[05-01-2023_Gap analysis Attachment B_List of requirements to support mRNA lab scale project.docx]

BGP investments in equipment to support mRNA lab-scale activities

After receiving the training at Afrigen, and upon receiving the intro package , BGP started procuring a lot of equipment to support the mRNA TT project



Equipment supporting mRNA project

Biosafety Cabinets (Thermo Fisher)

Incucell, Friocell & CO2 Cell Incubators (MMM)

Microplate Reader (Tecan)

Microplate Washer (Tecan)

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Equipment supporting mRNA project (Continued)

Fully automated liquid handling robot System (Tecan)

Automated Cell Counter (DeNovix)

(qPCR) Real Time PCR CFX OPUS 96 (Bio-Rad)

Liquid Nitrogen Tanks (Thermo Fisher)

Inverted Microscope with High Resolution Camera (Olympus)

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Equipment supporting mRNA project

2 Photo stability chambers 404 L (MMM)

+

4 Stability chambers 1212 L (MMM)

=

6 stability chambers of the German Brand (MMM)

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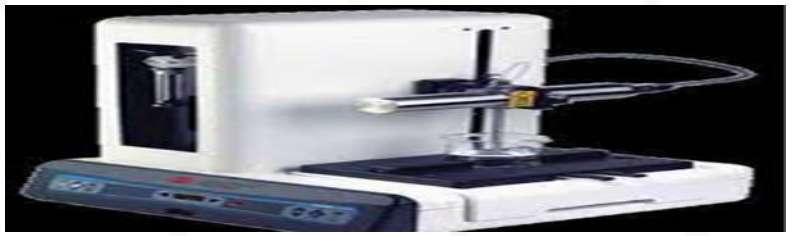
Equipment supporting mRNA project (Continued)

ICP (Agilent)

Liquid particle counter (Beckmann Coulter)



Analytical balances (Sartorius)

Moisture analyzer (Sartorius)

GC (Agilent)

FTIR (Agilent)

UV Spectrophotometer (Agilent)

Equipment supporting mRNA project (Continued)

Sciex PA800 Capillary Electrophoresis

- UV Detector
- DAD

Agilent 1290 Infinity II UHPLC

- DAD
- FLD

Agilent 1260 Infinity II Bio-Inert HPLC

- DAD
- ELSD

Agilent 1260 Infinity II HPLC

- UV Detector
- RID

Agilent 1290 Infinity II Bio UHPLC

- DAD

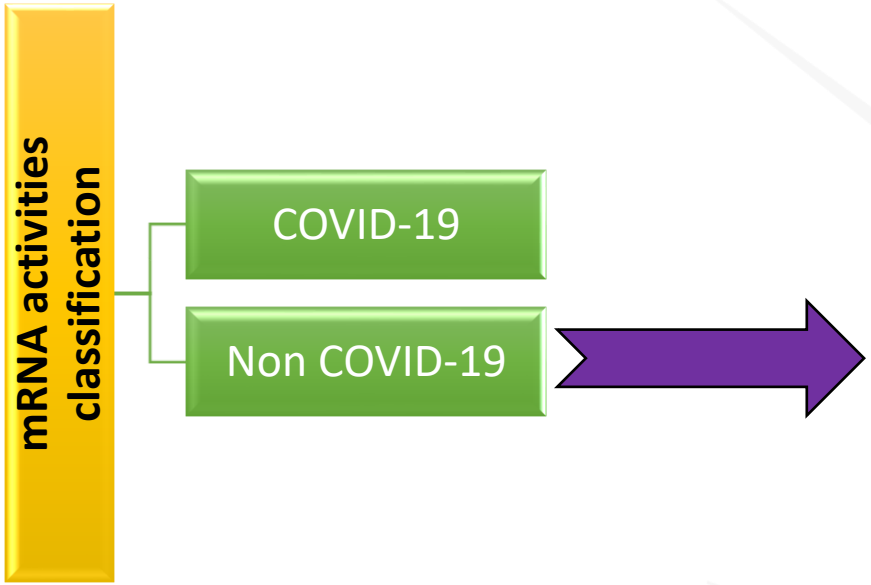
Agilent Cary 60 UV Spectrometer

- Xenon lamp
- Thermostated Multicell holder

Other Supporting Equipment (Continued)

- Milli-Q IQ 7005 Water Purification System
- Sartorius Analytical Balances
- Vacuum pump
- Ultra sonicator
- pH-meter
- Dry Block Thermostat
- Water Bath
- Hot plate/Magnetic Stirrer
- Vortex Mixer
- Vacuum Concentrator/Lyophilizer
- Thermo Scientific Centrifuges
- Gilson Micropipettes

Other steps done towards mRNA R&D Activities



1	Identification of target antigen through: • Preventive healthcare department MOH • EMRO WHO • Africa CDC • Academy of Scientific Research & Technology to identify priorities of researches in Egypt's healthcare	On-going
2	Collaboration agreement with Badr University in Cairo, Faculty of Biotechnology, research centre	Done
3	Agreement with laboratory animal facility for pre-clinical studies	Done
4	Agreement with CRO for clinical studies	Done

BGP's strategy for the mRNA platform

For Covid-19 vaccine:

- Design for a fit for purpose mRNA pilot production area to be revised in reference to the GMP layout in Afrigen
- Produce pilot batch(es) to ensure implementation & validation of the process
- Waiting to receive commercial-scale package of mRNA COVID-19 to start performing gap analysis
- Complete training for technology transfer of mRNA COVID-19 from South African hub

For non-Covid:

- BGP prepared an estimated budget for remaining missing equipment in the lab-scale gap analysis
- BGP dedicated and partially equipped two labs for R&D activities
- Decide along with the Egyptian government, Africa CDC and other entities to identify priorities of target antigens to start R&D activities

Thank you

For more information, check our website:
www.biogenericpharma.com

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