Defining Plasma Volume and National Self Sufficiency The Egyptian Experience



History about Plasma Fractionation

- Human plasma is the fluid portion of blood which constitutes from 50-55% of total blood volume. It contains many proteins, coagulation factors, antibodies,….etc. The extraction and purification of these constituents are of great medical importance.
- The history of plasma fractionation began in WWII, Edwin J. Cohn, developed a series of purification steps with the purpose of extracting albumin from blood plasma.
- The process is based on the differential solubility of albumin and other plasma proteins based on pH, ethanol concentration, temperature, ionic strength, and protein concentration. Albumin has the highest solubility and lowest isoelectric point of all the major plasma proteins. This makes it the final product to be precipitated, or separated from its solution in a solid form. Albumin was an excellent substitute for human plasma in World War Two to help soldiers suffering from shock and burns.

Plasma Derived Medicinal Products PDMPs

- Plasma derived medicinal products are manufactured from human blood plasma (plasma). Plasma can be obtained from whole blood donations **(recovered plasma**) or by apheresis procedures (**source plasma**). Plasma is the source of a wide range of medicinal therapeutic products that are used for the treatment and prevention of a variety of life threatening injuries and diseases often associated with protein deficiency states.
- Currently, over 30 distinct protein products can be isolated from human plasma.
- **Immunoglobulins** are needed to treat various immunological disorders, including primary and secondary immunodeficiencies, while high dose immunoglobulins have an immune modulating effect in neurological, haematological and dermatological (auto) immune diseases.
- **Coagulation factor concentrates** are infused to patients suffering from congenital or acquired deficiencies with products that contain single or multiple coagulation factors.
- **Albumin** is a physiological plasma expander that is administered in acute conditions to restore circulating blood volume and is also indicated for protein replacement in a number of liver diseases or used as replacement fluid in therapeutic plasma exchange .

Plasma Fractionation & GMP

- Improvements in protein purification and molecular separation technology over recent years have made available a wide variety of products, with medical applications covering a large and growing field, and the therapeutic value of these of PDMPs is unquestioned.
- The potential for viral transmission was well recognized, and because of the large number of donations which are pooled, a single contaminated batch of a plasma-derived product, with the contamination possibly originating from a single donation, can transmit viral disease to a large number of recipients.
- The recognition in the mid-1980's that plasma-derived products, in particular coagulation factor concentrates, had caused widespread transmission of human immunodeficiency virus (HIV) and non-A, non-B hepatitis (now recognized as mainly hepatitis C) resulted in major changes to the manufacturing processes, with the introduction of specific steps to inactivate or remove these and other blood-borne viruses.
- Therefore, Strict adherence to Good Manufacturing Practices GMP together with appropriate selection of healthy blood/plasma donors after review of the medical history, medical examination, testing of blood/plasma donations, post-donation information system play indispensable role in the safety and quality of plasma for fractionation.

Global Plasma manufacturers



Europe

- Spain
- Italy
- Germany
- Switzerland
- Austria
- Sweden
- France



Asia

- Korea
- China
- India
- Thailand
- Japan

North America



- USA
- Canada
- Mexico

South America

- Argentina

Australia



Plasma Collection for fractionation in Egypt

- Plasma is a Strategic resource as 60% of the world's Plasma supply comes from one country. That is why provision of National supplies of plasma derived medicinal products became a strategic goal.
- Actually, Egypt had started the pharmaceutical industry for fractionating domestic plasma in **Vacsera** in the War of 1973 and produced Albumin.
- Steps were made by **Vacsera** for toll fractionation with SK Korea But for legal and Regulatory problems hindered this attempt.

The National Project for Self-Sufficiency of Plasma Derivatives

It is a presidential initiative, to establish a National project for self sufficiency of plasma-derived medicinal products, aiming at – local provision of one of the highest technological and pharmaceutical industries in Egypt.



Main PDMPs



Immunoglobulin (IVIG)

-Immunological diseases
- Leukemia
-Neurological diseases
-Rheumatic disorders



Coagulation Factors (Factor VIII & IX)

- Hemophilia A & B

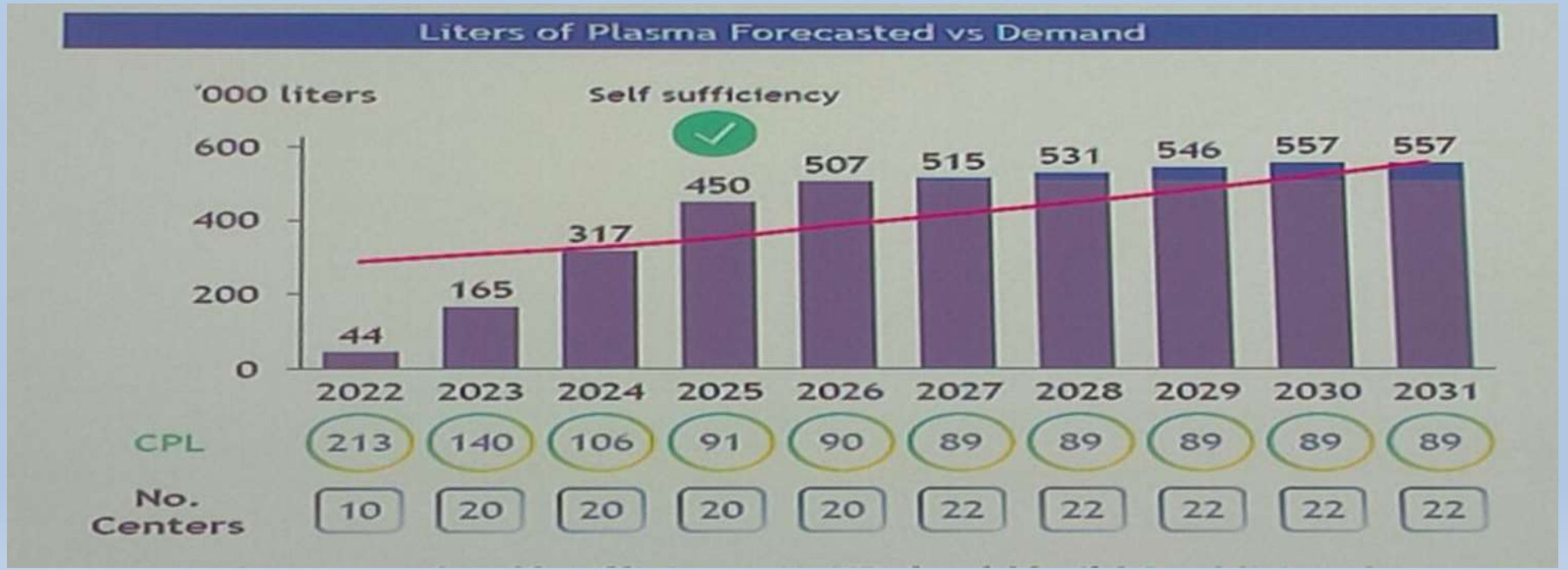


Human Albumin

- Liver diseases
-Heart diseases.
-Burns

Vision of the Project

Achieving self-sufficiency of plasma-derived medicinal products, especially (Human Albumin, Factor VIII, Immunoglobulin), consequently, exporting products to African and Middle East countries.









3 Pillars of the Project

- Plasma Collection for fractionation
- Plasma Toll- Fractionation
- Tech Transfer & Local Manufacturing plant



وزارة الصحة والسكان

خدمات نقل الدم القومية

National Blood Transfusion Services



1- Plasma Collection Centers:

Establishment of centers:

The project aims at establishing 20 plasma collection centers affiliated to the Ministry of Health and Population, at **National Blood Transfusion Services Centers** on 3 phases.

وزارة الصحة والسكان

خدمات نقل الدم القومية

National Blood Transfusion Services



Collection Targets:

The project aims at the collection of 300,000 Liters of plasma, with 400,000 donations by the end of the third year, gradually (soft opening), until reaching the societal awareness of Regular Plasma Donation to cover these targets.



2- Toll Fractionation (third party fractionation):

By communicating with global companies to discuss their willingness to contract for an Egyptian Plasma Fractionation project

KEDRION BIOPHARMA

LFB S.A.

GRIFOLS

3- Local Fractionation Plant

By setting up an Egyptian joint-Venture with a global specialized company of the field including Technology Transfer, aiming at reaching the objective of the project, which is local manufacturing and exporting the surplus of PDMPs to African and Middle East countries.





WHERE ARE WE ??

1- Construction and Infrastructure of the plasma centers

- Launching of the first 6 plasma collection centers in 5 governorates (Agouza , Abbassia , Dar El Salam , Alexandria, Tanta and Menia)
- 4 more new centers are under construction (Damietta, Sohag , Shebin El Kom and Ismailia)
- 10 more centers are in the process of designing of layouts for approval by NRA.

National Project for Self-sufficiency
of Plasma Derivatives

National Plasma Collection Center











National Project for Self-sufficiency
of Plasma Derivatives

Abbassia Plasma Collection Center











National Project for Self-sufficiency
of Plasma Derivatives

Dar El Salam Plasma Collection Center











National Project for Self-sufficiency
of Plasma Derivatives

Tanta Plasma Collection Center











National Project for Self-sufficiency
of Plasma Derivatives

Alexandria Plasma Collection Center











National Project for Self-sufficiency
of Plasma Derivatives

Menia Plasma Collection Center







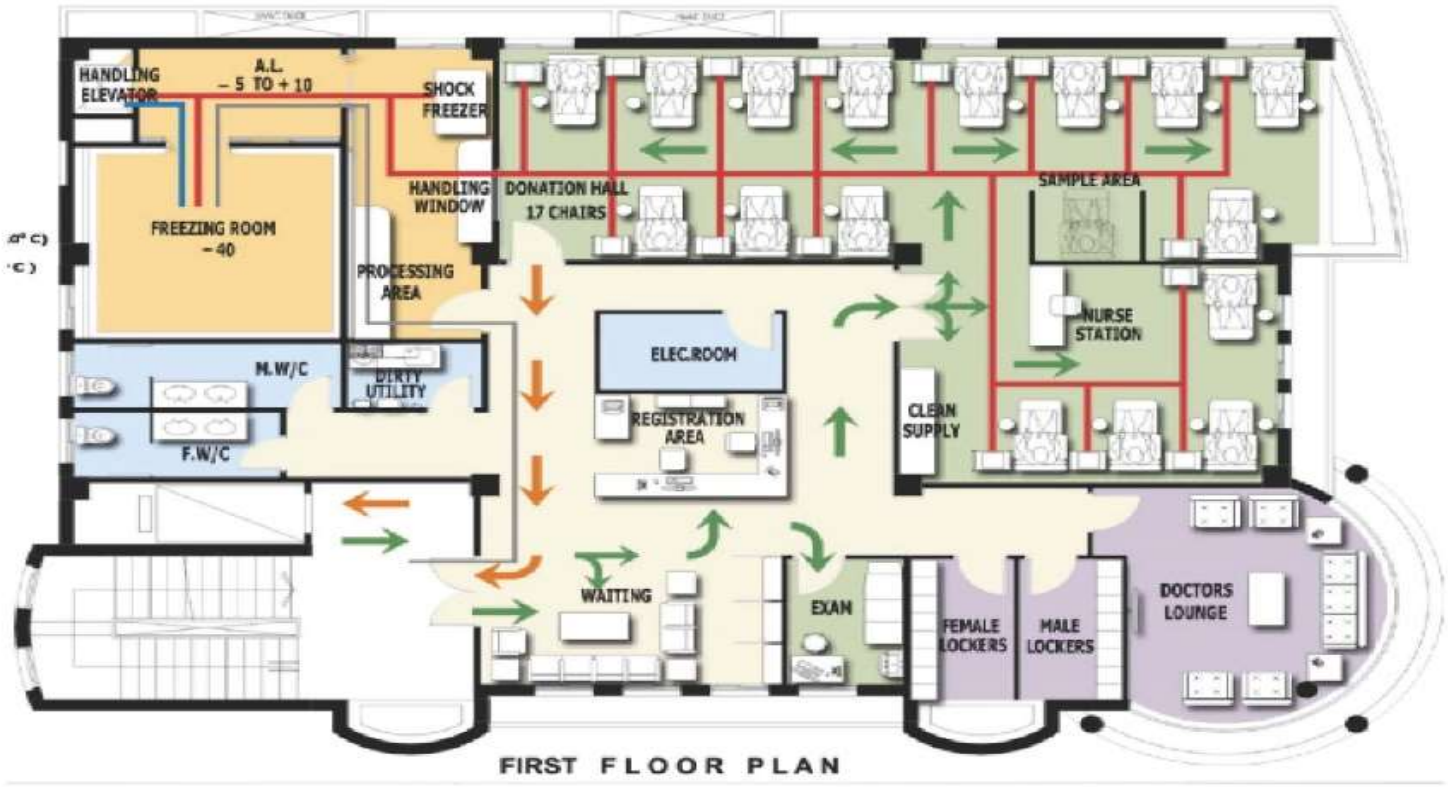




National Project for Self-sufficiency
of Plasma Derivatives

Shebin Elkom Plasma Collection Center
(Under Construction)





Ismailia Center Plasma Collection Center
(Under Construction)





National Project for Self-sufficiency
of Plasma Derivatives

Damietta Center Plasma Collection Center
(Under Construction)





Suhag Plasma Collection Center
(Under Construction)





2- Equipping of Plasma Collection Centers

Establishment of a Central Laboratory for all plasma donors' samples screening and testing (in Agouza), equipped with the latest platforms using the highest technologies in Virology, Blood grouping, Chemistry and NAT screening.









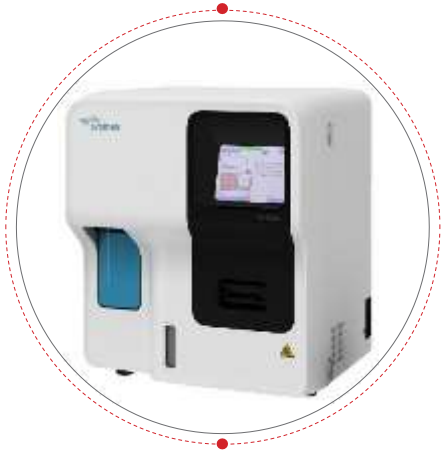
2. Equipping of Plasma Collection Centers















2. Equipping of Plasma Collection Centers

Both medical and non-medical equipment were selected according to WHO specifications and requirements







3- Freezing Chambers:

Installation of freezing chambers at 6 plasma centers (Agouza, Abbassia, Dar El Salam, Alexandria, Tanta and Menia)
.

IQ , OQ & PQ for the freezing rooms were performed.

A Central Plasma Warehouse is being designed by one of the largest Global companies in this field to store qualified plasma in palettes till shipping to the fractionator with a storage capacity of 100,000 plasma units.









3. Freezing Chambers:

<u>System of these chambers include:</u>

- Continuous Temperature Monitoring Systems are installed with the freezing rooms with Audible and Visual alarm systems.
- Managed by Plasma Management System and interfacing with the Plasma Management system.
- Using Barcode and RFID systems for inventory management and tracking of plasma units in the freezing chambers.

MAK-SYSTEM
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MEDINFO
INTERNATIONAL HEMOSERVICE

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We care

4. Plasma Management System:

- By contracting with one of the largest global companies in the field of automation of plasma collection centersfor full traceability for donors and plasma donations.



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- **PMS includes:**

- Donor management.
- Laboratory module.
- Interfacing with Plasmapheresis devices.
- Interfacing with medical equipment
- Interfacing with Plasma Inventory Management System.
- Interfacing to BMS & National Hepatitis C Survillance Program to create a National deferral and exclusion list for donors.

5. Quality and Accreditation



Quality and Accreditation:

World Health Organization (WHO) offered support for the project implementation since the preliminary phases through the following:

In November 2018, A team from National Blood Transfusion center had visited CSL Plasma Collection Center in Germany.



And also has visited governmental Blood Transfusion centers belonging to Sanquin in the Netherlands.









In January 2019, a 3 days workshop was organized for the technical team of the project with an expert German consultant, to address the roadmap for plasma projects for fractionation and the Quality requirements for plasma Collection for fractionation.

As well as, a 3 days workshop instructed by Sanquin on GMP requirements in Plasma collection centers.



In February 2019, a technical committee visited plasma collection centers and fractionation Plants in some European countries (Germany, Hungary and Italy) to explore the flow of work inside plasma collection centers and overview the whole plasma fractionation process in fractionation plants till manufacturing of final products.









WHO signed a Contract with an expert Consultant in the field of Plasma fractionation who settled the roadmap of the National plasma project with MoHP.

He established the cornerstones in the preliminary phases of the project .He selected the plasma collection sites and reviewed the layout /designs of the centers .





Implementation of Quality Management System in Plasma Collection Centers includes:

- Quality Manual (Quality Policies included)
- Site Master File
- Organizational Chart and Jds
- SOPs for all processes
- Validation Master Plan (for all critical equipment, freezers , Software ,…..etc)
- Calibration Master Plan
- Errors/Deviations Management System
- Change Management SOP
- Auditing Management System
- Risk assessment and associated SOP.
- Testing strategy for Plasma/Donor testing, Algorithms & SOPs
- SOP for Look-Back and Post-Donation Information management procedure
- Key Performance Indicators (KPIs)

WHO signed a Contract with an Australian expert, to ensure complying with GMP requirements and assisting the plasma collection centers, to acquire the international accreditation of IQPP .

On the other hand, Ministry of Health and Population (MoHP) requested assistance of WHO to fractionate domestic plasma to increase supplies of plasma derived medicinal products as well as to reduce the wastage of recovered plasma.

To respond to this request, WHO proposed the WHO's Achilles Project for Egypt (2021-2023), which is based on the experiences of similar WHO initiatives in South Africa and Indonesia.

6. Human Resource and Training

- HR plan for the needs of staff for each plasma center including all categories.
- Recruitment plan with the selection criteria of staff according to each job title was developed.
- Proper selection of competent staff.
- Training Plan was developed in order to build capacities ,enhance the skills and capabilities of staff.

7. Laws and Regulations

- Endorsement of the new law for regulating Blood & Plasma derivatives Law 8/2021 which included a separate section about Plasma collection for fractionation regulations .
- Egyptian Drug Authority (EDA) is the National Regualtory Authority in charge for inspection, licensing of Plasma Collection Centers as well as GMP certification of the centers.

8. Consultancy Agreement

McKinsey&Company

BCG BOSTON CONSULTING GROUP

An agreement with one of the global consulting groups is established in order to follow up, study and give advisory opinions at all phases of the project.

9. Marketing and Media Campaign

Launching of a large media campaign by the largest media companies in Egypt.

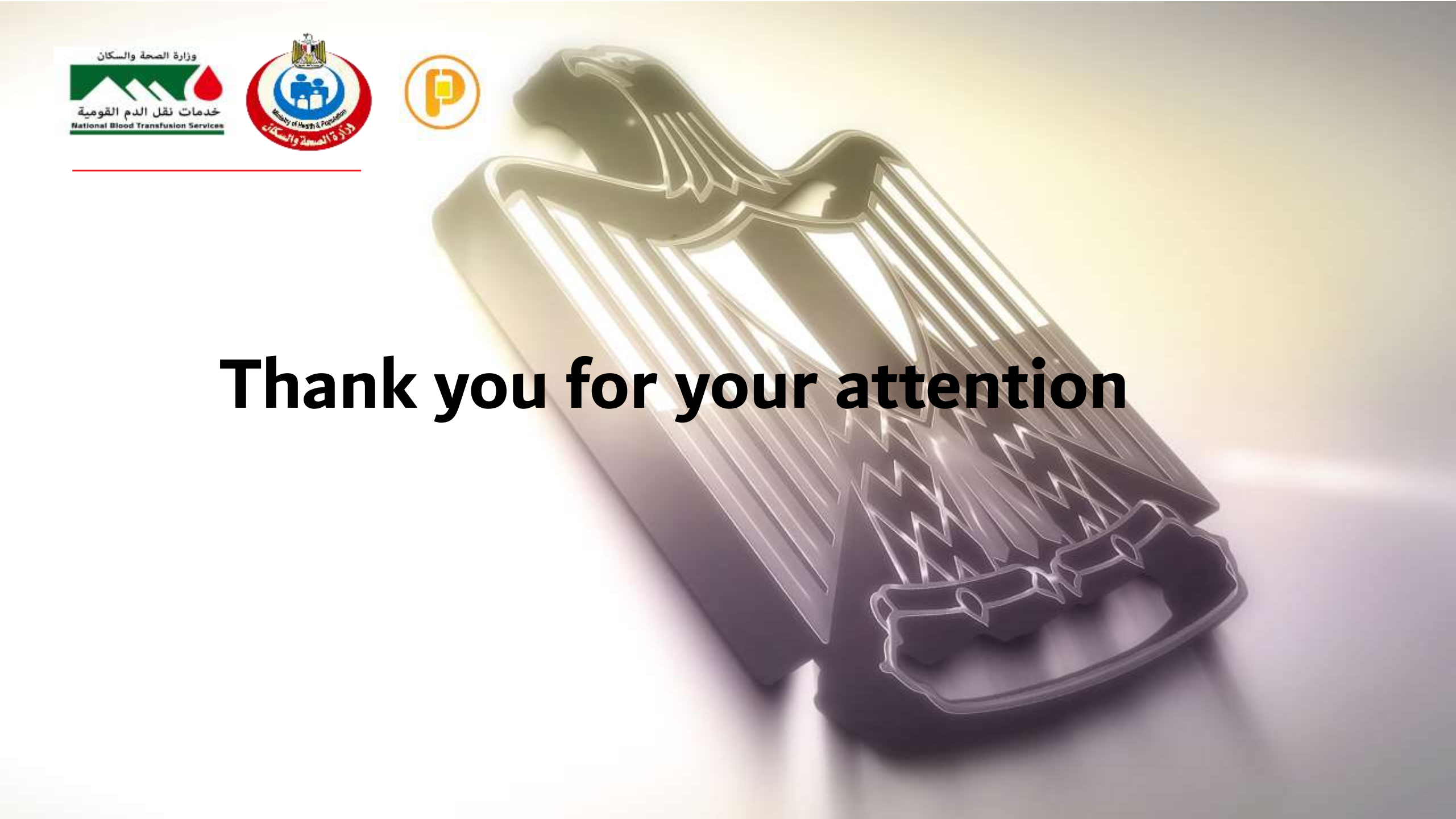
In order to raise Egyptian people's awareness about the National project for plasma collection and its importance, encouraging them to participate in plasma donation and being regular plasma donors.

Conclusion

GMP Certification Programme
Certified Biotech Manager

The Egyptian National Project for provision of PDMPs and achieving self – sufficiency is the presidential vision that Egypt started leading forward steps.

It will be a great leap in the middle East and Africa to establish a local manufacturing Plant in Egypt to afford plasma derivatives on the National level for Egyptian patients and export the surplus to the neighbouring countries .



Thank you for your attention