

History and Capabilities of Pasteur Institute of Iran at International Level



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Contents

Background and History of Activities	4
Pasteur Network	4
Lasting activities	5
Branches	8
The current state of research	8
The current public health services	10
The current production activities	10
Education	11
Importance and features	11
Plans, policies and operational strategies	12
Human Resource status	12
Special achievements	12
Fields of external interactions	13
Success factors in the international arena	13
Possible foreign investment opportunities	13
Position perspective	13

Background and History of Activities

Pasteur Institute of Iran is a research, production and educational institution established in 1920 to ensure the health of society. At that time, the necessity of establishing a scientific institution that could be active in the field of infectious diseases and be able to produce some vaccines was felt. Accordingly, on October 23, 1919 AD (1298 Lunar year), negotiations between the Iranian and French delegations were held at the Pasteur Institute in Paris, and on January 20, 1920 AD (1299 Lunar year), a co-operation agreement was signed between the two countries. From this time, the activity of Pasteur Institute of Iran began (Figure 1) and its activities have been expanding both quantitatively and qualitatively during more than a hundred years of activity.

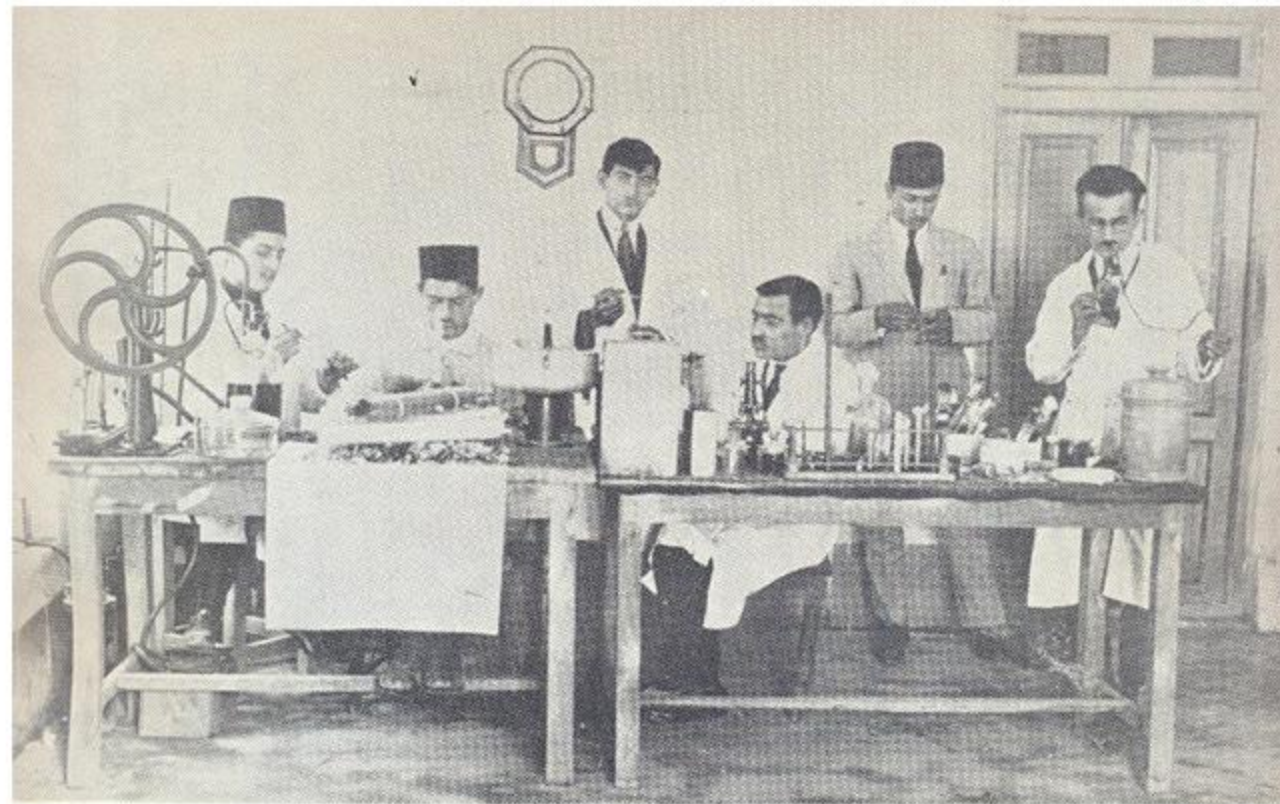


Figure1: The members of Pasteur Institute of Iran at the beginning of its establishment, 1920

Pasteur Network

The Pasteur Institute of Iran is the tenth Pasteur Institute in the Pasteur network. The first Pasteur Institute was established in Paris in 1887.

The goal of Louis Pasteur and his colleagues in establishing the Pasteur Institute was to create the greatest empowerment based on scientific findings around the world against infectious diseases. Based on this, Pasteur Institute researchers travelled all over the world to identify and control outbreaks of infectious diseases. This institution is named after its founder and first president, Louis Pasteur.

The Pasteur network, with the membership of 33 institutions worldwide, has been at the forefront of the fight against infectious diseases for more than a century.

This network operates based on a common mission. In general, the activities of the members of this network are in research, public health, national and international cooperation and interaction with industry and society.

Currently, Pasteur Institute of Iran is a member of the regional network of Asia-Pacific, consisting of China, South Korea, Hong Kong, Vietnam, Cambodia, Caledonia and Laos.

Membership in this network is an opportunity for Pasteur Institute of Iran to upgrade its joint research and educational activities.

Lasting activities

During its service period, Pasteur Institute of Iran has been the founder of scientific-health institutions and many effective measures, the most important of which are:

- **The control of infectious diseases in Iran:** During its more than one hundred years of service, the Pasteur Institute of Iran has taken great steps in preventing and control of infectious diseases in Iran has been removed.
- **The control of infectious diseases in other countries:** Plague experts and researchers of the Pasteur Institute of Iran carried out their research and activities in different countries such as Turkey, Syria, Iraq, Yemen, India, Indonesia, Thailand, Burma, Zaire, Tanzania, and Brazil (Figure 2), and also taught and transferred their experiences to different countries.



Figure 2: Overseas studies of Pasteur Institute of Iran; The study of plague in Brazil, Dr. Marcel Baltazard on the right and Dr. Mahmoud Bahmanyar on the left, examining the nest of rodents, 1966.

- **Production and export of vaccines:** Pasteur Institute of Iran has been one of the pillars of human vaccination production in Iran, and the vaccines for COVID-19 (PastoCovac) (Figure 3), B.C.G., smallpox, cholera, typhoid and hepatitis B produced by this institute has improved the level of people's health and safety.



Figure 3: COVID-19 vaccine produced by Pasteur Institute of Iran (PastoCovac)

Smallpox vaccines produced at Pasteur Institute of Iran exported to Iraq, Afghanistan and Egypt. The cholera vaccine produced by Pasteur Institute of Iran has been exported to France, Pakistan, Afghanistan, Turkey, Saudi Arabia and Ethiopia. Under the supervision of the United Nations Children's Fund (UNICEF), 238 million children from 22 countries of the world used the Iran-made BCG vaccine (Figure 4).



Figure 4: Implementation of the expanded programme on immunization based on the B.C.G. vaccine produced by Pasteur Institute of Iran since 1947.

In 2022, hepatitis B and B.C.G. vaccines produced by Pasteur Institute of Iran were exported to Venezuela, and plans are underway to export to other countries as well (Figure 5).



Figure 5: Export of B.C.G and Hepatitis vaccines produced by Pasteur Institute of Iran to Venezuela, 2022.

- **Disinfection of water in Tehran:** Before 1942, the aqueduct was used as a source of drinking water, and this caused the transmission of diseases such as typhoid and cholera through drinking water. Pasteur Institute of Iran analyzed the mineral waters of the springs around Tehran in its chemistry department and, through a national organization supported by the municipality, made it common practice to add chlorine to the clear water of the aqueducts and store these waters in large milky metal barrels that were placed on a horse-drawn cart. It was reaching the city, and with this means, the disinfection of Tehran water by Pasteur Institute of Iran was the beginning to reduce water borne diseases in Tehran.
- **Establishment of the leper village:** In the 1950s, Pasteur Institute of Iran, with the help of French, American and Russian research institutes, set up centers for the reception and treatment of leprosy patients in Mashhad, Tabriz and Tehran.
- **Establishment of a blood transfusion unit in Iran:** With the nationalization of the oil industry and the lack of foreign currency, the import of many products, including very necessary serums in hospitals, which was imported from abroad, was disrupted. In 1951, the production of injectable serums started at Pasteur Institute of Iran. The Iranian Blood Transfusion Organization was later formed based on the initial measures and activities of Pasteur Institute of Iran.

Branches

Pasteur Institute of Iran has five branches in the country. The main building is located in Tehran, Pasteur St., and at the same time, it has another branch in the Shemiranat area for vaccination services.

The research production complex of Pasteur Institute of Iran is located at 35km of the Tehran-Karaj highway. The research production complex of Pasteur Institute of Iran is built on a land of up to 18 hectares and has multiple production lines and also has a Good Manufacturing Practices (GMP) certificate and support facilities similar to the advanced manufacturing plant of the country (Figure 6).

Two other branches of Pasteur Institute of Iran are also located in Hamadan (Research Centre for Emerging and Re-emerging Infectious Diseases, Akanlu) and Amol City.



Figure 6: Research & production complex of Pasteur Institute of Iran

The current state of research

Currently, the research policy pursued by Pasteur Institute of Iran is to conduct basic and applied research in the field of diagnosing and providing control methods for various diseases with a focus on infectious diseases and emerging and re-emerging infectious diseases, conducting basic and applied research on the manufacture of biological products, conducting research in the field of basic medical sciences as well as performing joint research and educational projects with similar centers inside and outside of Iran.

This institute currently has three scientific journals (which are published in English) (Figure 7) and a biobank (microbial bank, cell bank, and Mycobank).



Figure 7: Research & production complex of Pasteur Institute of Iran

Pasteur Institute of Iran is currently considered one of the top centers in the field of biotechnology in the country and has made significant progress in this field, especially the production of recombinant drugs and vaccines.

The Pasteur Institute of Iran has the first rank in terms of the number of papers per faculty member and the third rank in terms of webometric indicators among the 33 institutes that are members of the Pasteur network. At the same time, this institute is one of the leading institutions among the research institutions in the country in terms of the number of papers per faculty member and the number of citations per published papers. The trend in the number of international papers shows the growing trend of international cooperation in the scientific productions. About 22% of the papers of the Pasteur Institute of Iran have been published with international cooperation (**Figure 8**).

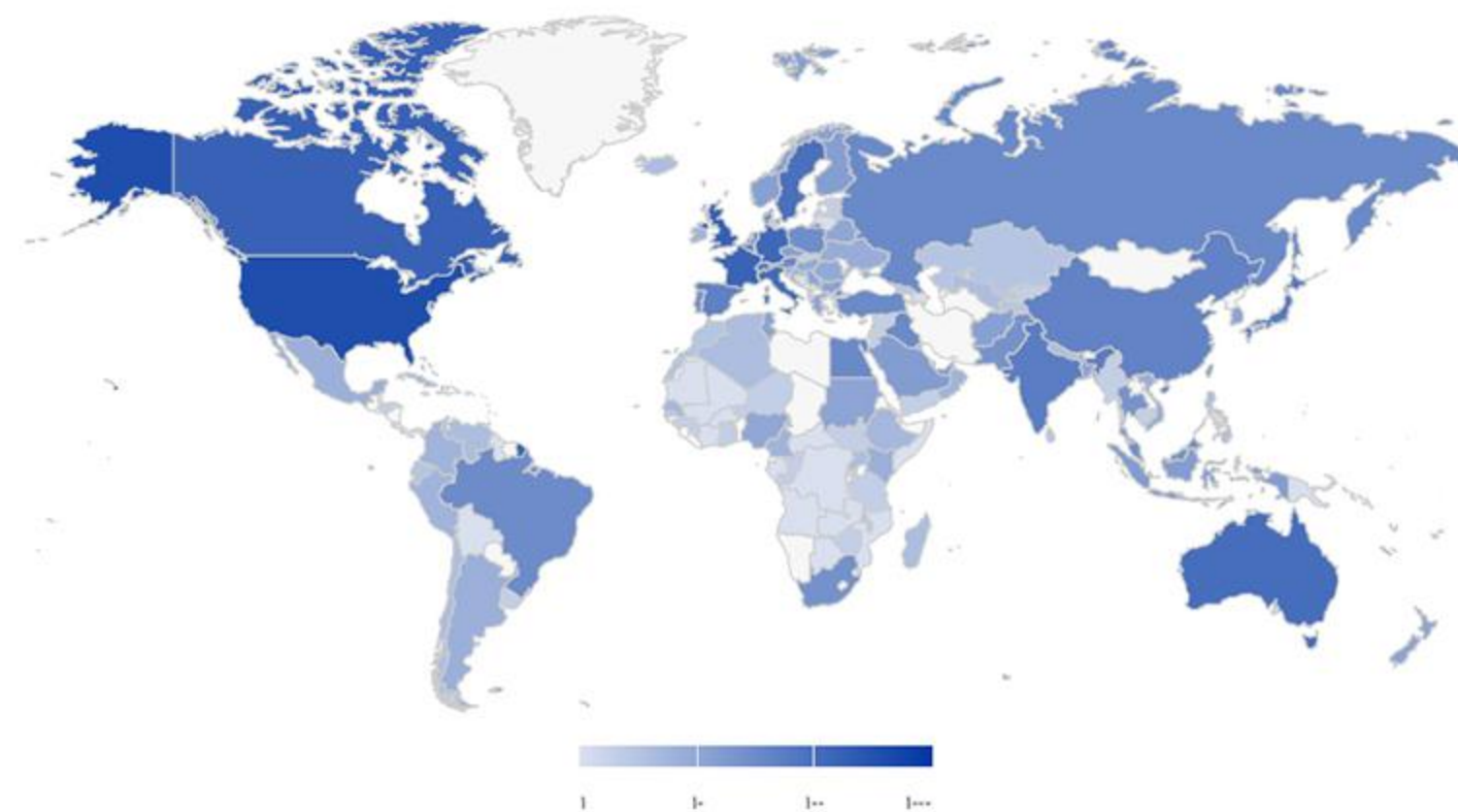


Figure 8: Countries with which researchers of the Pasteur Institute of Iran have published joint papers with their scientists in the last thirty years

The current public health services

In the field of specialized public health services, various activities are carried out at Pasteur Institute of Iran.

The rabies department of Pasteur Institute of Iran works as a World Health Organization collaborating center. National reference laboratories of Pasteur Institute of Iran include laboratories for COVID-19, E-coli, arboviruses and viral hemorrhagic fevers, biochemistry, malaria, whooping cough, plague, tularemia, Q fever, protein chemistry, prenatal diagnosis and rabies; in the meantime, this institute has national collaborating laboratories for HIV/AIDS, hepatitis, and influenza.

Pasteur Institute of Iran works in the field of diagnosis and research on other diseases such as tuberculosis, leishmaniasis, toxoplasmosis, borreliosis, bartonellosis, anthrax, botulism, brucellosis, and fungal diseases. At the same time, several specialized areas of Pasteur Institute of Iran also study and research on non-communicable diseases such as cancers and genetic disorders.

In the era of COVID-19, the laboratory network for molecular diagnosis of COVID-19 was formed centered on the Pasteur Institute of Iran and with the membership of more than 500 public and private laboratories across the country, and the simultaneous diagnosis kit for COVID-19 and influenza and the screening kit for important variants of COVID-19 were produced by the Pasteur Institute of Iran and was distributed in the laboratory network of the country. Meanwhile, since the beginning of the COVID-19 pandemic, the COVID-19 external quality assurance programme (EQAP) of the COVID-19 laboratories was carried out throughout the country, and at the same time as the monkeypox pandemic, its diagnostic kits were produced by the researchers of the institute and distributed in the country.

The current production activities

The production activities take place in the production and research complex of the Pasteur Institute of Iran.

Production of mandatory vaccines required by the country's health, such as hepatitis B and lyophilized B.C.G. vaccine, cholera diagnostic antigens (Inaba and Ogawa serotypes) and polyvalent required by Ministry of Health, animal rabies vaccine delivered to the veterinary organization, production of injectable solutions (7 products) needed by the country's health care system (Figure 9), diagnostic kits for salmonella, malta fever, tuberculosis, etc., Pastosis anti-cancer products, delivery of all kinds of laboratory animals for quality and research tests, quality services to applicant companies and cooperation in contract production for Knowledge-based companies is one of the other activities of this complex.

During the emergency of the COVID-19 pandemic, this complex has supplied two products, including the COVID-19 vaccine (PostoCovac vaccine) and the culture medium for virus transmission, to the health system of the country in the shortest time and after validating and ensuring the correctness and efficiency. The production and delivery of more than 16 million doses of the COVID-19 vaccine in the first 6 months of 2022 is a confirmation of the unique role of this institute in the mission of serving public health.



Figure 9: Injectable products produced at Pasteur Institute of Iran

Education

Student training: Pasteur Institute of Iran educates students and related researchers in the specialized doctoral level (PhD) of pharmaceutical biotechnology, medical biotechnology, systematic biotechnology, medical bacteriology and specialized research-oriented doctorate (PhD by research).

Holding international training courses: The Pasteur Institute of Iran, due to its inherent scientific and research nature, has witnessed the holding of dozens of scientific meetings and educational workshops at the international level. The international course on rabies monitoring and control was organized in October 2017 with the participation of 22 foreign researchers, the international summer school workshop on field epidemiology was held in August 2017 with the participation of 25 foreign researchers and the international workshop on rodent-borne diseases in October 2018 with the participation of 30 foreign researchers and experts.

Importance and features

- Membership in Pasteur network
- Diagnostic authority of important infectious and non-communicable diseases of Iran
- Exclusive production of some biological products such as human vaccines, diagnostic kits, and anti-cancer drugs and supplying shortages of competitive products such as injectable drugs and laboratory animals
- Planning to expand the portfolio of existing products for the production of pneumococcal and rotavirus vaccines
- Conducting applied and mission-oriented researches

Plans, policies and operational strategies

- Assisting the Ministry of Health in diagnosing, preventing and controlling infectious diseases
- Advising neighboring countries to diagnose, prevent and control infectious diseases
- Expanding the portfolio and increasing the share of production from the amount of vaccines available in the national safety program
- Exporting vaccines and other biological products to other countries
- Joint production and research and more effective presence in the international and regional arena
- Recruiting international students
- Expansion of international interactions with other countries
- Expanding scientific communication with the Pasteur network

Human Resource status

Pasteur Institute of Iran has 135 faculty members. About 250 people of Pasteur Institute's employees work in laboratory work, about 150 people work in production, and about 500 experts work in non-laboratory and research support areas. Pasteur Institute of Iran has about 100 students studying.

Special achievements

- Monitoring, diagnosis and control of infectious diseases
- Production of leading scientific papers
- Production of vaccines for COVID-19 (PostoCovac), hepatitis B, B.C.G and animal rabies
- Production of diagnostic kits for salmonella, malaria, cholera etc.
- Breeding all kinds of laboratory animals
- Production of injectable drugs for health care system needs and anti-cancer products

Fields of external interactions

- Advising other countries to control infectious diseases
- Authority of rabies Laboratory as WHO Collaborating Center

- Technology transfer and co-production of hepatitis B and PastoCovac vaccines in cooperation with Cuba
- Exporting vaccines and other biological products to other countries
- Production of developmental vaccines such as pneumococcal conjugated vaccine through joint production
- Carrying out joint applied research projects with other countries
- Signing of the memorandum and joint international programs to develop international activities

Success factors in the international arena

- Expert and opinionated human resources in the form of a working group
- Membership in the Pasteur network
- Continuous improvement of product quality
- Compliance with international requirements and related standards
- Performing knowledge-based activities

Possible foreign investment opportunities

- The possibility of joint vaccine production according to the existing and future infrastructure
- The possibility of joint vaccine production as a joint venture

Position perspective

- Increasing the role of Pasteur Institute of Iran in the field of infectious disease control in the region and the world
- Increasing the portfolio of products, especially in the field of human vaccines
- Quantitative and qualitative review and promotion of products to enter global and regional markets
- Strengthening production circles with program-oriented, aligned and result-oriented research and development to master the technical knowledge chain with the ability to transfer it.