



## ORIGINAL ARTICLE





### In Honor of Dr. Mehdi Assmar, a Distinguished Researcher at the Pasteur Institute of Iran

#### Abstract

Dr. Mehdi Assmar is a prominent researcher in Iran, with a specialization in parasitology and medical entomology, who has done a large amount of research related to the public health in Pasteur Institute of Iran and other institutions or universities for four decades. Most of his research has been on plague, recurrent fever, malaria, toxoplasmosis and leishmaniasis. Discovering the cause of resistance to plague infection among the rodents of the Kurdistan region is one of his important achievements. During his research, he found the extent of plague in the studied areas, the frequency of wild rodents and their external and internal parasites, the susceptibility of different strains of plague strains to antibiotics, and the effectiveness of systemic toxins in controlling the rodent fleas. This paper provides an overview of his scientific activities.

**Key words:** Pasteur Institute of Iran, Plague, Relapsing Fever, Malaria

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### **Introduction**

Pasteur Institute of Iran is a research, production, service, and educational institute established to improve public health in the community. This institute was established in 1920 and has played an important role in controlling infectious diseases, such as plague, smallpox, cholera, typhoid, polio, rabies, hepatitis, recurrent fever and arboviruses in Iran and in the world. This institute is a member of the international network of the Pasteur Institute. For more than a century, Pasteur Institute scientists have also developed vaccines and other biological products.

In this study, we have reviewed the activities of Dr. Mehdi Assmar, who, for decades, have been one of the leading members of the health and research system of the Pasteur Institute of Iran, playing an important role in the prevention and control of diseases. Becoming familiar with expert and experienced scientists who have played a vital role in the success of this institute and getting to know their activities can illuminate the future path of health research.

For a long time, Dr. Mehdi Assmar was the director of research done on human plague, malaria vectors, toxoplasmosis, recurrent fevers, brucellosis, hydatidosis, tularemia, and recurrent fever. He was in charge of the research teams of the Pasteur Institute of Iran and had missions to different regions of the country for conducting scientific research.

### **Education and scientific degrees**

Dr. Mehdi Assmar was born on September 2, 1922, in Qazvin. He passed primary and secondary education in this city. In 1966, he was admitted to the Faculty of Science, Tehran University, to study biology. He, at the same time, studied educational science in the Faculty of Educational Sciences of Tehran University. He received his master's degree in Medical Entomology in 1972. In 1976, Assmar began his PhD in Medical Entomology and Vector Control at Tehran University with the support of Dr. Younes Karimi (Mahdavi, De Almeida and Mostafavi, 2019, pp. 1-6), who was Vice President of Pasteur Institute of Iran. He earned his PhD degree in 1981.

In 1985, Dr. Assmar received a scholarship from the World Health Organization for studying tropical diseases and serological diagnostic methods in the Royal Tropical Institute, University of Amsterdam, Netherlands. He, in addition, completed a training course in malaria cultivation in Canada in 1991, an electron microscope course in Germany in 1992, and a malaria resistance course in France in 2003. He also took a six-month sabbatical leave in 1997 in Parasitology at the University of Toronto, Canada.

Dr. Assmar promoted to associate professor in 1993 and to research full professor in 2000 (Figure 1).

### **Work experience**

After completing his military service in 1965, Assmar was employed as a teacher in Qazvin and worked as a teacher until 1971. After studying Medical Entomology, he was employed by Dr. Ahmad Mesghali, the head of the Department of Medical Entomology and Vector Control at the School of Public Health in the University of Tehran in 1972 and became a member of the Institute of Health Research in Kazeroon. Dr. Assmar travelled to various areas of Fars and Bushehr provinces during his two-year working mission at the Kazeroon Research Center of Malaria Control. He had an important role in control-



ling malaria in that region. At that time, malaria was one of the most common infectious diseases in the country in that region.



*Figure 1. Dr. Mehdi Assmar over time, Adapted from Newsletter of Iranian Scientific Society of Parasitology, No. 37, Summer 2016, and Personal album*

He returned to Tehran in 1974 and started to work at Pasteur Institute of Iran by the support of Dr. Abolhassan Nadim, who was the head of the School of Public Health at the University of Tehran and the founder of Modern Epidemiology in Iran (Mostafavi, et al, 2017, pp. 264-72; , Assmar, et al, 1997, pp. 19-21). After a successful internship in Pasteur Institute of Iran in the first six months of his career, studying plague infection in Kurdistan, he was employed as a laboratory expert at epidemiology department of Pasteur Institute of Iran in the same year.

In 1981, he was appointed as the head of the Epidemiology Laboratory, and after the retirement of Dr. Younes Karimi, he was appointed as the head of the Department of Epidemiology. He was the Vice-president of the Pasteur Institute of Iran in 1982, the Research deputy of this institute in 1983, and the head of the Department of Parasitology in 1985. He was the Research Deputy and the Educational Deputy of Pasteur Institute of Iran. He was also a member of the Scientific Board of Medical Entomology and Vectors Control for many years and a member of the National Committee of Vector control, Malaria, and Crimean Congo Hemorrhagic Fever.

His most prominent activities, as the deputy of research of Pasteur institute, were establishing PhD programs in biotechnology in Pasteur Institute of Iran, setting up the North branch of Pasteur Institute of Iran in Amol, and promoting the status of expert researchers in the Pasteur Institute into faculty members.

After his retirement in November 2008, Dr. Assmar continued his academic activities as a faculty member of Islamic Azad University in Lahijan branch, and as a member of the editorial board of the Iranian Journal of Public Health. Since 1991, he has been collaborating with the Pathobiology Laboratory of Danesh in diagnosing infectious, parasitic, and autoimmune diseases.

In 2018, a street was named after Dr. Mehdi Assmar in the village of Akanlu to show appreciation towards his services (Figure 2).





*Figure 2. One of the passageways in the village of Akanlu was named as Dr. Mehdi Assmar, 2018; Personal album*

### **Scientific activities**

Most of his research studies was on plague, relapsing fever, toxoplasmosis and leishmaniasis. During his working time, he carried out numerous missions throughout the country to perform research and control infectious diseases (Figures 3 to 6).



*Figure 3. Dr. Mehdi Assmar in the Field Mission in Kurdistan, 1993; Personal album*



*Figure 4. Dr. Mehdi Assmar, second from the right, in front of The Research Centre for Emerging and Reemerging infectious diseases of Pasteur Institute of Iran, Akanlu, Hamedan, 1989; Personal album*





*Figure 5. Mohammad Hanifi and Dr. Mehdi Assmar in Plague Studies in Kurdistan, 1986; Personal album*



*Figure 6. Gonbad Kavus. Dr. Mehdi Assmar and deceased Mohammad Hanifi, 1988; Personal album*

### **1- Plague**

Although his work on plague began in 1974, in the following years, he entered the epidemiology department of Pasteur Institute of Iran. In his PhD dissertation, he compared *Merion persicus*, in the areas near Tehran, as a susceptible animal to plague, with *Merion persicus*, in the Akanlu region, as a disease-resistant animal, in terms of morphological, ecological and internal characteristics including genetic markers, cytogenetics and intestinal flora bacteria. There, he stated that the possible cause of resistance in Kurdistan's plague reservoirs was their different floral bacteria (Assmar, et al, 2018, pp. 86-94).

In the following years, Dr. Assmar continued studying plague in the high risk areas in the west of the country in the research center of emerging and re-emerging infectious diseases of Pasteur Institute of Iran, Akanlu, Hamedan (Mostafavi and Keypour, 2017, pp. 139-58). He and the field team of Pasteur Institute of Iran collected rodents, rabbits and carnivores and their ectoparasites, and studied the plague infection in the collected samples. The findings of his research helped the research team of the Pasteur Institute of Iran to determine the extent of plague-infected areas and the frequency of wide rodents, ectoparasites, and endoparasites. In 1976, when he performed investigations in the lands



around Ardabil, he isolated the plague bacteria from one *Meriones persicus* and presented his research findings in a meeting held by the World Health Organization on plague in the Soviet Union.

Dr. Assmar also examined the antibiotics sensitivity of different strains of plague isolated from different local plague strains (Nekouie, and Razavi, 2017, p. 9) and evaluated the effectiveness of systemic toxin in controlling the wild rodents' flea.

His another activity, in the research center of emerging and re-emerging infectious diseases of Pasteur Institute of Iran, Akanlu, Hamedan, was to hold workshops for research and health teams of the country on plague. The participants of these workshops were representatives of different provinces of the country (Figure 7).



*Figure 7. Workshop on plague in the research center of emerging and re-emerging infectious diseases of the Pasteur Institute of Iran, Akanlu, Hamedan, 1993. Dr. Mehdi Assmar, Mohammad Hanifi, Hamed Hanifi are seen in the picture; Personal album.*

## **2- Toxoplasmosis**

He was also engaged in studying the *Toxoplasma gondii* parasite. In a comprehensive study, he and his colleagues performed research on nearly 13000 samples collected from 12 provinces in 1997, identifying anti-toxoplasma antibodies in 51% of the samples (Assmar, et al, 1997, pp. 19-21). They, in addition to studies conducted on this parasite's immunity, also performed studies for early identification of Toxoplasmosis-infected embryos to prevent subsequent possible abnormalities (Assmar, et al, 2004, pp. 1-4; Assmar, et al, 1997, pp. 19-21; Golkar, et al, 2005, pp. 1-8; Golkar, et al, 2004, pp. 170-6; Elyasi, et al, 2010, pp. 1349-55; Assmar, et al, 1999, pp. 93-7.).

Dr. Assmar also found the toxoplasma antigen to detect toxoplasmosis by immunofluorescence method in the Pasteur Institute of Iran.

## **3- Relapsing fever**

Furthermore, while studying the *Borrelia* infection, he examined the vector infection, disease reservoirs, their diagnostic methods and epidemiology of the disease in the country (Aghighi, et al, 2007, pp. 14-8; Assmar, et al, 2002, pp. 227-30; Assmar, et al, 2002, pp. 267-72; Karimi, et al, 1979, pp. 157-68; Asmar, Ghavami, and Pyzask, 2001, pp. 22-7; Asl, et al, 2009, pp. 160-64; Nekoui, et al, 1999, pp. 103-9; Zamani, et al, 2014, pp. 190-7; Asmar, Ghasemi, and Karimi, 1981, pp. 12-3.). The findings of his study cul-



minated into a paper entitled "A new way to eradicate tick return fever" published in the Journal of Medical Council of Iran in 1981. The coauthors of the paper were Dr. Younes Karimi and Dr. Norair Piazak (Karimi, and Piazak, 1981, pp. 342-346).

#### **4- Leishmaniasis**

He performed various studies on cutaneous leishmaniasis (Nahrevanian, et al, 2007, pp. 233-40; Khabiri, Bagheri, and Assmar, 2006, pp. 184-6; Parvizi, and Assmar, 2007, pp. 25-37; Parviti, et al, 1998, p. 186; Farahmand and Asmar, et al, 2008, pp. 1-7) and visceral leishmaniasis (Farahmand and Nahrevanian et al, 2008, pp. 81-4.) in Iran. In these studies, it was shown that the use of insecticides and environmental health principles was necessary to prevent the transmission of infection in humans (Nekouie, et al, 2006, pp. 77-81). He also performed studies on the immunology (Nahrevanian, et al, 2012, pp. 21-8), treatment (Assmar, et al, 2003, pp. 1-8; Khabiri, et al, 2005, pp. 239-43), epidemiology (Parvizi, et al, 2008, pp. 1273-8) and diagnosis (Khabiri, Bagheri, and Assmar, 2007, pp. 629-32) of leishmaniasis. In his studies, it was shown that using molecular methods can help to identify new and old leishmaniasis (Doroodgar, et al, 2015, pp. S54-S8; Mahboudi, et al, 2002, pp. 756-8).

#### **5- Fascioliasis**

Following an outbreak of this disease in Anzali port in 1988, he started extensive studies on this disease and learned more about the disease's epidemiology in this region (Assmar, et al, 1991, pp. 23-7). He also conducted studies to treat patients (Yadegary, Forghanparast, and Assmar, 1991, pp. 43-4; Hatami, et al, 2012, pp. 266-72). Dr. Assmar showed that health education and health care could lead to a quick diagnosis, preventing similar outbreaks (Hatami, et al, 2012, pp. 266-72; Assmar, Motavallian, and Masiha, 2005, pp. 11-6).

#### **6- Malaria**

Dr. Assmar was the head of the research teams which worked on various aspects of malaria disease, including identifying its possible vectors in Iran (Dezfouli, et al, 2002, pp. 133-7). In these studies, while studying various aspects of the epidemiology of this disease, he investigated mosquitos and human hosts' infection to this parasite in different regions of the country (Assmar, et al, 2003, pp. 15-9; Assmar, et al, 2005, pp. 19-26; Zamani, et al, 2009, pp. 1-9). In the meantime, some more research was carried out to investigate the immunology (Nahrevanian, et al, 2006, pp. 201-9; Nahrevanian, et al, 2008, pp. 39-44), diagnosis (Heidari, Assmar, and Dalooi, 2005, pp. 21-4; Loutfy, et al, 1998, pp. 1852-5), potential carriers (Naddaf, et al, 2003, pp. 257-65; Dezfouli, et al, 2003, pp. 56-60) and drug resistance (Esmaeili Rastaghi, et al, 2008, pp. 48-56; Razavi, et al, 2008, pp. 31-4) of the patients.

#### **7- Other diseases**

He also conducted studies on leptospirosis (Razavi, et al, 2008, pp. 31-4), cryptosporidiosis (Nahrevanian, Assmar, and Ghorbani, 2005, pp. 77-86; Nahrevanian, and Assmar, 2006, pp. 33-6; Nahrevanian, and Assmar, 2008, pp. 74-7), hydatid cysts (Khabiri, et al, 2006, pp. 357-62; Khabiri, et al, 2007, pp. 22-6; Siavashi, et al, 2005, pp. 91-4),



trichomoniasis (Masiha, and Asmar, 2007, pp. 49-58; Valadkhani, et al, 2008, pp. 113-7; Valadkhani, et al, 2010, pp. 31-36; Valadkhani, et al, 2010, pp. 190-4), brucellosis and some other diseases and factors affecting them (Nikokar, Hosseinpour, and Asmar, 2011, pp. 1366-71; Nahrevanian, et al, 2005, pp. 164-8; Rezaei-Chaparpordi, et al, 2012, pp. 75-79; Assmar, et al, 2016, 45(12), pp. 1645-51; Yeganeh-Amirkande, et al, 2015, pp. 1-5; Ramtin, and Massiha, 2014, pp. 35-9; Akbari-Shahabi, et al, 2014, pp. 38-41).

Dr. Assmar also designed and produced diagnostic kits of hydatid cysts and leptospirosis during the period when he worked at Pasteur Institute of Iran (Ghorbanalinezhad, et al, 2001, pp. 67-70).

During his working period in Pasteur Institute of Iran, he had several missions to attend scientific meetings and present his scientific findings in different countries, including the Soviet Union (1975 and 1982), Italy (1985), France (1985, 1991 and 2005), Brazil (1990), Sweden (1993), Germany (1993), Japan (1995), Tunisia (1996), Cuba (1996), Singapore (2002), Thailand (2002 and 2007), Turkey (1997 and 2003), Canada (2003), Spain (2004) and England (2006 and 2008).

### 8- Published books

One of his books is “Flea” published, in 1980. There, he, along with Dr. Norair Piazak and Dr. Younes Karimi, has provided the pictorial key to identify the fleas of Iran. This book is still a leading source of identifying the Iranian fleas (Figure 8) (Asmar, Karimi, and Pyazak, 1979).

His other book is “Toxoplasmosis, Tularemia and Listeria”, published in 1983, and his co-authors are Dr. Younes Karimi and Dr. Mahdokht Pourmansour (Figure 8) (Asmar, Karimi, and Pourmansour, 1982).

The publication of the book, entitled “Histology of wild rodents” in 1984, has played an important role in presenting the results of the studies on histology of these rodents in Iran (Figure 8) (Asmar, Pousty, and Amirkhani, 1984).

The book entitled “Medical Rodentology”, written by Assmar and Hassan Nekoui, was published in 2009. The book is an important step in identifying the diseases transmitted by rodents and the importance of controlling wild rodents in urban and countryside regions (Figure 8) (Assmar, and Nekouei, 2010).



Figure 8. Figures of some books written by Dr. Assmar; Personal album

### The Highlights of his life

Although Dr. Assmar was a specialist in Medical Entomology and Vectors Control, he





worked well in line with the primary goals of Pasteur Institute of Iran, studying, identifying and controlling infectious diseases. Moreover, he shared and transferred his knowledge to other colleagues participating in field missions of Pasteur Institute of Iran. As an epidemiologist, he played an important role in controlling outbreaks and conducting numerous research works at Pasteur Institute of Iran.

Pasteur Institute of Iran made a momentous decision to employ Dr. Assmar who, at that time, had passed a six-month training course. Having reviewed the period of his career, we found that his employment was a correct “selection” made by Pasteur Institute of Iran. This can be used as a model for employing the future staff of Pasteur Institute of Iran and other educational research centers.

Dr. Assmar is an example of the grandee of Pasteur Institute of Iran, who spent his life serving the country to achieve its scientific objectives.

### Conclusion

For decades, combining field investigation and laboratory studies has been a key solution to many research and epidemiological hypotheses. The myriad of applied research performed has addressed a number of the health problems current in the country. Some of these studies accomplished finding some solutions published in the international guidelines.

Over the years, research teams, led by Dr. Mehdi Assmar, have found the distribution of the plague in the areas under investigation and examined rodent and flea's fauna that transmit the disease to some parts of the country.

Dr. Assmar also played an important role in guiding and converging applied research related to leishmaniasis at the Pasteur Institute of Iran. In his studies, he identified new and old leishmaniasis. He was also the founder of Toxoplasma antigen production to diagnose this disease at the Pasteur Institute of Iran. He was also a member of the national committees and scientific boards of Medical entomology and vector control, malaria, and Crimean Congo hemorrhagic fever.

Dr. Assmar, with his enduring activities, including publishing scientific papers, has played an important role in maintaining the promotion of the Pasteur Institute of Iran in the country and the world.

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