

## History of Medicine

# In Honor of Dr. Ahmad Fayaz, A Prominent Rabies Researcher

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**Abstract**

Dr. Ahmad Fayaz is one of the famous scientists in Iran in the field of rabies, and the most prominent person in controlling and prevention programs in the country in recent decades. One of his most important scientific achievements was introducing a new rabies vaccine produced in human diploid cell cultures to treat people exposed to rabies infection. Following that, anti-rabies serum therapy and injection of five doses of the cellular vaccine were entered into WHO protocol. Dr. Fayaz, as an expert and consultant of WHO, traveled to several countries and recommended appropriate ways to control rabies.

This paper intends to celebrate his scientific contributions through reviewing his services and researches.

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**Introduction**

Dr. Ahmad Fayaz was born in 1936 in Hamedan province, where he accomplished the primary and secondary education. Subsequently, he entered the University of Tehran and graduated in veterinary medicine from the Faculty of Veterinary Medicine in 1960 (Figure 1), and then he started working in Pasteur Institute of Iran.

When he entered Pasteur Institute of Iran, Dr. Marcel Baltazard, the director of Pasteur Institute of Iran taught Dr. Fayaz methods of field researches, in the Research Center of Plague which is now called the Research Centre for Emerging and Reemerging Infectious Diseases, along with Dr. Younes Karimi, Dr. Mansour Shamsa and Dr. Mahmoud Bahmanyar in Akanlu village of Hamadan (Figures 2 and 3). After that, he began his official research on rabies in department of rabies in Pasteur Institute of Iran.

After several years of working in Pasteur Institute of Iran (Figure 4), he went to France to study medical virology and rabies in 1970, and also spent two years in related academic courses in Pasteur Institute in Paris.

In 1975, he completed the immunology course successfully at the American University of Beirut, and after returning to Iran, he continued doing research in the Department of rabies in Pasteur Institute of Iran (Figure 5). In 1976, He taught novel experimental methods in Wistar Institute of Philadelphia.

He was appointed as the head of Department of Rabies in 1977, and WHO Collaborating Center for



**Figure 1.** Dr. Ahmad Fayaz, the First Person Sitting Right, in the Period of Studying in Faculty of Veterinary Medicine, University of Tehran, 1958.



**Figure 2.** Dr. Ahmad Fayaz on a Mission to Study Plague, With a Map of the Area in Hand, at the Research Centre for Emerging and Reemerging Infectious Diseases of Pasteur Institute of Iran, Akanlu Village, Kabudr Ahang, Hamadan Province, 1961.

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**Figure 3.** Study Group of Pasteur Institute of Iran: From right: Dr. Ahmad Fayaz, Mohammad Hanifi, Vahhab Hazrati, Dr. Younes Karimi, Abbas Babarzadeh and Hamed Salarkaia in Akanlu, Village, Kabudar Ahang, Hamadan Province, 1961.



**Figure 4.** Dr. Ahmad Fayaz, Making Dilutions of Rabies Virus, Pasteur Institute of Iran, Tehran, 1964.



**Figure 5.** Dr. Halfdan Theodor Mahler, the General Director of the World Health Organization, Visiting Pasteur Institute of Iran; and Presenting Activities About Prevention and Treatment of Rabies by Dr. Ahmad Fayaz, 1974.



**Figure 6.** A 6-Year-Old Child Attacked by a Rabid Wolf. In the site of bite, the brain and the spine were illustrated and under the guidance of Dr. Fayaz and following the treatment with anti-serum and rabies vaccine, he was rescued from rabies (after 2 years in 1984), Tehran.

Rabies Research and Reference in 1978, and held this responsibility for 30 years.

He carried out activities for development of rabies vaccination and treatment of individuals bitten by rabid animals (Figure 6).

Dr. Ahmad Fayaz traveled to different countries such as Afghanistan, Pakistan, Guinea and Tunisia as an expert of WHO and advised health authorities for rabies control.

He retired after 47 years of service in Pasteur Institute in Iran.

### Honor Badges

Dr. Fayaz was appointed as an expert on rabies by WHO Secretary-General in 1994. The prize of the French Academic Palms was awarded to him in 1998 (Figure 7).

He was chosen as a distinguished doctor due to his activities in the field of rabies by the Iranian Medical Council in 2005, and also was selected as one of the best physicians of 30 years of health activities, and a certificate was also awarded to him by the Presidency in 2008.

Currently, he is a member of the Board of Trustees and consultant of the director of Pasteur institute of Iran for developing relations with the Institut Pasteur International Network.

His other responsibilities are the membership of



**Figure 7.** Academic Palms Awarded to Dr. Ahmad Fayaz from the Prime Minister of France in 1994..

the Advisory Panel of the WHO on rabies, and also membership of the rabies technical committee of the Ministry of Health, and Iran Veterinary Organization. In addition to numerous lectures at various congresses, he has contributed to more than 80 research papers that the most important ones are concerned with selection of the best methods to treat rabid human beings, and are conducted in collaboration with researchers from Pasteur Institute of Paris. This method is commonly used to save rabid human beings in the world, and has been

introduced to the international guidelines. Dr. Fayaz also contributed to compilation of the books on rabies such as “rabies control”, and compilation of the rabies section of “Epidemiology and Control of Common Infectious Diseases in Iran” and also “Neglected Tropical Diseases in the Middle East and North Africa”.<sup>1</sup>

### Results of his Studies on Rabies

To identify the importance of scientific and executive activities of Dr. Fayaz, his important scientific activities in the field of rabies are reviewed in this section.

Rabies is a viral encephalitis disease that its virus can be transmitted from rabid animal to other animals and humans. Although rabies can be prevented with effective and safe vaccines indebted to well-known scientists such as Dr. Ahmad Fayaz, this disease is still a health problem in many countries around the world. Dr. Fayaz, in collaboration with Dr. Mahmoud Bahmanyar, did many efforts to achieve an effective treatment to rescue people bitten by rabid animals from 1967 to 1972.<sup>2-4</sup> One of their most important scientific achievements was introducing a vaccine produced in cultures of human diploid cells for the treatment of humans bitten by rabid animals, in 1976. The results of this study were accepted by WHO, and subsequently, treating with anti-rabies serum and injection of vaccine in five doses on days 0, 3, 7, 14 and 30 after bite was introduced as an effective treatment to protect humans against rabies. This method entered the international guidelines.<sup>5</sup>

In 1981, he emphasized the booster effect of human diploid vaccine on people treated with that, and showed that those receiving a booster dose of the rabies vaccine will be safe if they are re-exposed to the virus.<sup>6</sup>

He performed extensive epidemiological studies in various parts of Iran in the field of rabies. In these studies, he suggested appropriate control activities by identifying the reservoirs of the disease and its transmission ways. In 1975, Dr. Fayaz in collaboration with Dr. Younes Karimi introduced foxes as one of the most important reservoirs of rabies in Iran.<sup>7,8</sup>

From 1981 to 1985, Dr. Fayaz and his colleagues studied rabies bites in Iranians and showed that people in Persian Gulf and Caspian Sea regions of the country are more at risk of bite than other regions.<sup>9</sup> He showed that implementation of rabies control programs, particularly removal of reservoirs, animal immunization, training and raising awareness of the population, could reduce the risk of rabies significantly.<sup>10</sup> He showed that dog bites are the most common source of rabies infection in Iran.<sup>11</sup> In his studies, appropriate epidemiological information was obtained to control rabies by identifying main reservoirs and the ways of rabies transmission.<sup>12</sup>

By his collaboration, two cases of rabies were

transmitted through corneal transplantation in Iran, and both recipients died of rabies in 1996.<sup>13</sup>

In 1997, he presented a simpler method to produce animal rabies vaccines, compared to other vaccine production methods, providing a satisfactory and highly effective immune response. In addition, in the same year, he offered a new vaccination protocol for injection of human diploid cell vaccines to individuals at risk of rabies with the aim of reducing the cost and amount of vaccine injections.<sup>14,15</sup>

In epidemiologic studies conducted by molecular methods on rabies virus strains in Iran, seven strains of rabies virus were defined that improved disease control.<sup>16,17</sup> In 2003, by examining genetic and molecular characteristics of rabies virus, various types of this virus were reported in Iran.<sup>18</sup> Positive cases of rabies in some provinces were investigated in details in 2006.<sup>19</sup>

He showed that antibody level was significantly higher in people who received full rabies vaccine and also a booster dose, comparing those who did not receive the vaccine completely. Based on the findings of his study, pre-exposure vaccinations of rabies and a booster dose were emphasized mostly for at-risk people to maintain high levels of antibodies.<sup>20</sup>

In 2007, the efficacy of two anti-rabies cell vaccines produced in Iran and Argentina were compared in a number of dogs. The results of this study showed that the dog vaccine produced in Pasteur Institute of Iran could be replaced with the imported ones.<sup>21</sup>

During 2008-2010, based on the results of the study on people with immunodeficiency disorders, he suggested that these individuals should be treated with both vaccine and anti-rabies serum if they are bitten by a rabid animal.<sup>22</sup>

In collaboration with Dr. Ahmad Fayaz, six deaths from rabies without any history of animal bite during twenty years (1990-2010) were investigated in Iran, and some of the indirect transmission modes were explained.<sup>23</sup>

In 2011, a study was conducted on 45 cases of people who had been bitten by rabid animals and treated with a diploid cell vaccine from 1975 to 1976. With confirming the presence of rabies antibodies in their bodies after more than 30 years, it was shown that the vaccine booster dose raised the antibody levels in their blood significantly.<sup>24</sup>

Dr. Fayaz and his colleagues' studies showed that intradermal injection of rabies vaccine increases the antibody titer.<sup>25</sup> Furthermore, with his collaboration, proteomics analysis was performed at early stages of rabies infection on different strains of the virus, and the results showed useful information about the immune response affected by viral strains and its pathogens.<sup>26</sup> Proteomics analysis of the human brain tissue infected by rabies virus showed that the virus disrupted essential

functions of the nervous system. These analysis could help to detect antiviral drugs for treatment of rabies.<sup>27,28</sup>

Moreover, in collaboration with Dr. Mohammad Taghavian, a new dental pulp stem cell line was introduced as a cell substrate for development and production of rabies vaccine.<sup>29</sup>

Dr. Fayaz also conducted several studies to examine other aspects of rabies in Iran.<sup>30-40</sup>

He also conducted some studies on other viral infectious diseases to resolve health problems in the country such as rotaviruses,<sup>41,42</sup> haemophilus influenza type C<sup>43</sup> and Crimean Congo hemorrhagic fever<sup>44,45</sup> in addition to studies on rabies.

### Challenges of Rabies Control in the Country Based on Dr. Ahmad Fayaz's Comments

- The most important factor to control rabies is collaboration between different organizations such as municipalities, veterinary authorities, the Ministry of Health, the Iranian Department of Environment and other related organizations.
- The main problem to control rabies is lack of a regional network in Iran and its neighboring countries. Next problem is controlling disease in wild animals, which unfortunately has not been taken seriously in Iran, while in European countries where foxes are reservoirs of rabies virus, a systematic plan for immunization with the distribution of oral rabies vaccine has begun approximately 10 to 15 years ago, and now France, Germany, Belgium and Switzerland are free of this disease.
- One of the most important acts to be taken for controlling this disease in the country is to reduce the number of stray dogs and immunize domestic dogs. Annually, there is an average of 125 000 animal bitten people in the country many of them are children under age of 15 years. Of course, the majority of them are treated, and we have only 3 to 7 persons with rabies each year in our country that are not referred to rabies treatment centers.
- Increasing the awareness of people, especially individuals living in villages, is highly effective in controlling and treating rabies, so that each bitten person washes the site of the wound and goes to the rabies treatment centers promptly. Moreover, people who keep pets must be vaccinated for rabies.
- The mortality rate of rabies in our country is extremely promising in comparison with neighboring countries such as Pakistan where 2000 people die of this disease annually. Prevention centers in Iran are well-equipped.<sup>46</sup> Hoping for a day when no rabies is reported or observed in the country.

### Authors' Contribution

Both authors have contributed to this paper from the draft stage by outlining, reviewing, drafting and finalizing the manuscript.

### Conflict of Interest Disclosures

The authors declare that there are no conflicts of interest regarding the publication of this paper.

### Ethical Statement

Not applicable.

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