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Editorial:

EMERGING VIRUSES AND THEIR IMPACT ON HEALTH

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Versión en Español

The term "emerging viruses" refers both to newly emerging viral infections in the population and to previously known viruses whose incidence or geographical distribution is rapidly increasing.

The mechanisms facilitating their emergence can be likened to the emergence of an unknown virus through the evolution of a new variant. Secondly, through the crossing of the species barrier, which conditions the introduction into a host of a virus existing in another species. And thirdly by the spread of a particular virus from a small population sample (human or animal), which acts as an ecological niche, in which it arose or was originally introduced[1].

Although this phenomenon is not new, there is growing international concern about its remarkable increase, which has been detected mainly in the last four decades[2,3]. In this regard, it is worth noting how the entry of smallpox, first in Europe and then in America, represents only one of the examples that could illustrate in retrospect the great impact among affected populations of the sudden emergence of infectious diseases. In more recent times, it seems appropriate to mention the emergence of Human Immunodeficiency Viruses (HIV)[4] and the severe social, economic and health effects associated with them until the current emergency caused by the Monkeypox Virus affecting humans[5] or the most recent description of the circulation of the

Henipavirus Langya, recorded in the Chinese provinces of Shandong and Henan[6] at the end of 2022.

Over the last decade, a significant number of new viruses have been described and have been reported in different continents as being considered as human disease-causing viruses. In this regard, in chronological order, the description of the Ocozocoautla arenavirus found in Mexico in 2013[7], the Thogotovirus Bourbon of the Orthomyxoviridae family, which was transmitted by ticks in the USA in 2014[8], and the Orthobunyavirus Itaya, associated with a febrile syndrome in Peru in 2015[9], are new in this respect. Sosuga paramyxovirus, previously described in fruit bats, was characterised as an aetiological agent of haemorrhagic fever in Sudan in 2016[10]. A new filovirus called Mengla[11] (similar to Ebola and Marburg) was also reported in bats in China in 2019[11], and a new duck orthoreovirus called "N-DRV" in China in 2020[12]. Lanama picornavirus activity in apes in Uganda was also reported in 2020[13] and Songling virus activity in human febrile illnesses in China in 2021[14].

With the above, a large number of previously known viruses have re-emerged, with arboviruses such as Dengue, West Nile, Yellow Fever, Zika, Chikungunya, Japanese Encephalitis and Rift Valley Fever being particularly noteworthy[15].

Zoonotic viruses

The wide diversity of emerging and re-emerging pathogens correlates with a great variability in life cycles, transmission routes, pathogenicity and epidemiology. The ability to emerge has been found to be associated with some pathogen taxa more than others, with certain routes of transmission and with a broad host range[16]. A large proportion of emerging viruses are zoonotic, with those infecting domestic and wild animals requiring the most attention. The animals involved include primarily vertebrates such as rodents, primates and bats, as well as birds. Their threat derives from their ability to jump interspecifically, thus affecting a new population that has not developed any immunity or protective response to a new agent.

It is well established that zoonoses are generally vector-borne. Taking into account their mode of transmission, the largest number of zoonoses are arthropod-borne viruses (mainly generalist vectors), followed by those requiring indirect contact (via food or water) and finally those requiring direct contact. Several characteristics are therefore assumed to be common to most emerging and re-emerging viruses, allowing a "model emerging virus" profile to be established. This would correspond to a virus with an RNA genome, zoonotic, vector-borne, capable of using conserved receptors in many species, potentially transmissible between humans and whose ecosystem is located in areas undergoing ecological, demographic or social change[17].

Emergence and re-emergence of viruses

The emergence of new viruses or the re-emergence of known viruses cannot be explained by simple models. Most authors agree that it is rather an interaction of factors involving three fundamental aspects: the susceptible population, the virus itself and the environment of both[18]. It is clear that immigration from rural areas to cities implies major demographic changes. WHO estimates that 65% of the world's population will be living in cities by 2025. Travel and immigration, legal or illegal, and the existence of refugees following armed conflicts also involve large population movements. These changes can significantly affect the degree of dispersal of animal-host viruses and especially vector-borne viruses. In addition to temperatures and associated global warming, which favours the spread and establishment of vectors

from tropical to temperate areas, the availability of water, as mentioned above, is a key element.

Certain factors affecting the population are the increase in average age, higher levels of immunosuppression, greater exposure to UV radiation, stress, etc., but above all, social inequalities must be taken into account. Poverty favours the emergence and establishment of new infectious agents[19]. In addition, many re-emerging diseases reappear after being maintained in a pocket of population, often characterised by high levels of poverty, from which the infectious agent spreads.

In the last three decades, due to major advances in communications and greater access to transportation for the general population, travel[20] has become increasingly important as a means of spreading emerging viruses, as infections that appear anywhere in the world can cross entire continents in days or weeks. Thus, the Aedes albopictus mosquito, a potential vector for a large number of arboviruses and highly aggressive, has been spread throughout the world by being transported in shipments of tyres, first from Asia and then from any place where the vector is present. The virus can travel in its vector or be carried by a sick person, with the consequences extending beyond the traveller to the population and the ecosystem. There are many reasons to travel: leisure, business, immigration, refugees, pilgrims, missionaries, aid workers, merchant seafarers, students, temporary workers, armies, or peacekeepers.

Infectious agents are living, dynamic organisms with the ability to adapt to their environment. This is especially important for viruses whose genome is RNA as their polymerases have a very high error rate facilitating rapid change in these agents[21].

In discussing the factors that favour the emergence and re-emergence of viral infections, consideration should be given to those that influence both the introduction of a new pathogen into the population and those that play a role in its establishment and subsequent spread. Once the new agent is established in the human population, its geographical spread and the magnitude of outbreaks depend essentially on the route of transmission and the rapidity of its distribution to new population groups as well as on the period of viraemia, the associated lethality and the initial number of infected persons. However, the capacity of health services to control infection in the population is the main factor that determines its impact. There is no doubt that, immersed as we have been in a SARS-CoV-2 pandemic which, although essentially respiratory transmission, is an emerging virus, public health surveillance systems must optimise their performance. The dissemination of knowledge in this field and continuous training are two pillars to keep health professionals up to date in the field of emerging arboviruses[21].

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