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Review Article

Origin of the HIV and Evolutionary History of the Viruses

Giulio Tarro[1,2]*

[1]*President of Foundation de Beaumont Bonelli for Cancer Research, Naples Italy*

[2]*Committee on Biotechnologies and VirusSphere, World Academy of Biomedical Technologies, UNESCO, Paris, France*

***Corresponding Author**: Giulio Tarro, President of Foundation de Beaumont Bonelli for Cancer Research, Naples Italy and Committee on Biotechnologies and VirusSphere, World Academy of Biomedical Technologies, UNESCO, Paris, France.

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Abstract

Today the origin of the HIV is considerad a Zoonosis, that is an infection trasmetted to man by an African chimpanzee. This hypothesis proposes that by hunting or other behavior involving contact with the blood of African monkeys, a simian immunodeficiency virus (SIV) is transfered to men (Human immunodeficiency virus, HIV) It seems that the native strain of HIV originated in 1931 by analysis of genetic sequences and subsequentely injecting drug use and sexual behavior patterns began the epidemic. The vairola major, the viral agent of the smallpox, was eradicated in the human species since 1979 when a global vaccination was able to win the war against this letal disease (30%): the remaning stains are kept in two laboratories, one in Atlanta (USA) by CDC and another in Russia, obviously with no chance to become a bioterrorist weapon.

Keywords: *HIV; Herpesvirus; HPV; Smallpox*

Origin of the HIV

The human immunodeficiency virus (HIV) originated via a process of natural evolution, probably emerging from the primate SIV reservoir into the human population via hunting or other behavior involving contact with the blood of these animals [1]. A particular subspecies of African chimpanzee, the Pantroglodytes troglodytes, has been recognized as the mostprobable original source of human infection. Through molecular biology studies, it has been possible to establish a relationship between the HIV and the Simian immunodeficiency Virus (SIV), identifying a 98% genetic homology between these two viruses, and building a solid viral genealogical tree. Therefore the infection from HIV is a zoonosis, an infection transmitted to the man by other animal species: HIV migrated from the primate reservoir to humans by hunting or by tribal rites that implied contact with the blood of these animals. SIV would then have become HIV via various genetic mutations over many years. The hypothesis was made at the Chicago Conference in February 1999, where a particular kind of chimpanzee, Pantroglodytes troglodytes, has been recognized as the most probable source of infection in humans.

In the small tribal comunities of Africa HIV probalby existed for long time. During the colonial period the urbanization caused mass migrations and more liberal customs spread with the conclusion of different areas of prostitution and then increase of sexual contact. Therefore it was created a "chuster" of infected people that favored the local spreading of HIV.

Subsequently, various factors such as the contact with the West, the use of unsterilized hypodermic syringes in vaccination campaigns, and the use of blood transfusions in cases of malaria, favored the wider spread of HIV, and its transmission to the West. The drug addition and sextual liberation brought to the epidemic of the 1980 and 1990. David Ho an coworkers published an article in Nature claiming traces discovery of the genome of HIV in a blood sample belonging to a man who lived in Kinshasa (Congo) and died in 1959. By molecular analysis of this virus, compared with more recently isolated viral strains, it has been possible to estimate the origin of the HIV as being before 1940, thereby suggesting the hypothesis that the transmission of the virus from chimpanzee to man first occurred approximately 70 years ago. In a follow-up paper, published in the journal Science, further analysis of the genetic sequence of the virus, aided by sophisticated statistical models, has allowed researchers to estimate that the native strain of HIV originated after 1931.

Evolutionary history of the viruses

When studying such a major component of the biosphere as the viruses, it is important to apply a molecular approach that allowes their isolation and the determination of individuality among the various strains, types and subtypes of the same family. It is known that PCR is any important method of approach among diagnostic technology even for national health security. There is an opportunity to assess the public health events and medical microbiology emergency in the enviroment for which teams respond quickly and appropriately to biothreats; and provide real-time health benefits to the population while maximizing early detection and appropriate responses to potential bioterrorist acts.

Interaction between viruses and host

Having entered the host cell, viruses can give rise to acute, latent or persistent infection. In the acute case the virus causes the death of the host or is eliminated from the body. In the other cases of infection the virus may replicate or establish a latent infection with the onset of eventual replication. Finally the latency is different for each herpesvirus even if the viral particles are located where can be protected by the immune system [2].

There are molecular mechanisms that allow the viral genome to remain in a latent state [3], and those leading to exit from latency and resumption of the lytic cycle of viral replication [4].

HSV1 and 2 infect epithelial cells and yield latent infections in the neurons [5].

HSV 1 is classically associated with oropharyngeal lesions, while HSV 2 primarily infects the genital mucosa.

The Varicella Zoster Virus (VZV) causes the disease known as chickenpox in primary rash and establishes a latent infection in neurons, which [6], if reactivated, causes herpes zoster (shingles).

The Polyomaviridae family includes, among others, JC Virus (JCV), BK Virus (BKV) and SV40. The primary infection caused by these viruses is asymptomatic and occurs during childhood, followed by latency [7,8].

The host immune system blocks the function of the polyomavirus that is reactivated by the immunosuppression or the lack of host competence the replication of the virus causes the disease.

Hepatocellular carcinomas are associated with B and C hepatitis viruses. Infection with B hepatitis Virus is responsable for 50% of all liveer cancer that are now prevented by an effective vaccine, used as compulsory in Italy since 1990, when all newborns and 12 years children were vaccinated.

Human Papilloma Viruses (HPV) have been correlated with cervical cancer, with genotypes 16 and 18 being considered particularly carcinogenic in humans [9]. The first vaccine against HPV was released by the FDA in 2006.

The viral proteins E6 and E7 are able toinhibit oncosuppressors during the process of malignant transformation [10,11].

In the Flaviviridae family is the place for HCV. Its infection can remain stable and cause mild hepatitis, liver cirrhosis or it may evolve in hepatocellular carcinoma [12].

The variaton of the genome is the main strategy of the virus to evade the immune response.

The consequence of the heterogeneity of HCV gene expression and its ability for genetic and then phenotypic mutation, are therefore at the baseof such a high rate of chronic infections, of the not efficacy of the therapies and also of the difficulty of preparing vaccines.

Smallpox virus and vaccination

From the " Malignancy" of the oncogenic viruses now we move to that one of the Smallpox virus and the possibility for suchviruses to be used as weapons in bioterrorism even if they were eradicated by a global vaccination, real pacemaker of other Viral Vaccines.

The Variola major virus that causes the letal smallpox, 30% of the cases, was eraticated by global vaccination in 1979. At present in two laboratories, one in Russia and another in the USA, are present two "historical footprint" under the World Health Organization maximum security. Therefore since more strains of human smallpox do not exists anylonger it would be not possible to build a bioterrorist weapon.

Despite this, the debate on the vaccinations in recent times is closely bound to the threat of a bioterrorist attack; these arguments define lurid, apocalyptic scenerios that have received disproportionate coveragein the mass media, and have already resulted in a whole series of "exercises", such as those held in England in December 2002, to face a hypothetical attack with smallpox virus.

One can say that any isolated bioterroristic attack cannot have any chance of instigating a devastating epidemic nevertheless numerous films, novels and articles. Only an army can bring an ordered biological attack by the use of conventional bombing to destroy healthy systems and command building (adding furthermore crowding of the refugees before germs or toxins pathogenic attack), bioterrorism would presumably launch an attack on a focused target, with an entire region able to react to the threat. This hypothesis is supported by declassified reports, such as the epidemiological studies on people successfully hospitalized following the experimental dissemination of a non-harmful bacterial agent by the US Department to the Defense in the New York subway in 1956. A less deliberate example occurred in England in 1962 when a researcher, George Bacon, became infected with a modified strain of Yersinia pestis (bubonic plague) at the biological warfare facility of Porton Down, UK, and exposed the outside world to this infection before dying.

Continuing on this theme, another example is the accidental release of smallpox from the University of Birmingham, UK in 1978, which killed three people. The main question is why Yersinia pestis, lethaly modified in Porton Down, and Vairola major that are trasmitted by the respiratory route were unable to produce an epidemic catastrophe. The antivariola vaccine, compulsory for all in Europe, for few in England, played an important role regarding the Birmingham accident. The solid health infracture did not collapse at the infection announcement. Only the mass media can create the real problem by an irresponsable emphasis of a bioterrorism attack which might be able to instigate a panic, with a consequent mass exodus from the area, spreading the epidemic.

The use of mass-vaccination to protect against a terrorist attack using the smallpox virus has clearly been discarded, as indicated by a document published in the New York Times, "Supplemental Recommendation of the ACIP on Use of Smallpox" compiled June 20 2002 by the Advisory Committee on the practices of immunization and submitted to the Department of Human Health of the United States (HHS) and to the Center for the Control of the Epidemics (CDC), which approved in Despite this the proposal of a vaccination of mass against the smallpox (of 500.000 people in the United States only) continues to be in the front among the "initiatives" of the Western countries to face a bioterroristic attack of which (beyond the case of the "letters at the anthrax" that allowes to glimpse responsibility not surely referable to some fanatical person) no comparison is found.

Although the threat of these infectious diseases, and therefore the problem of administering vaccinations, seem to be relatively unimportant issues in Western countries, in many areas of the 'Third World' extremely poor sanitary conditions and the unattainably high cost of vaccines could result in a death sentence for millions of people.

Evolution of man and genomic mutation. Future perspectives

It takes a long time for genomic mutation to proceed from the monkey state to human being, that is eight-million-year evolution corresponding to only 2% of genomic mutation that some viruses reach during just 5 days of replicative activity.

Type A influenza viruses have a strong tendency to mutate, changing their own structure rapidly, and this genetic variability can be divided into antigenic drift, with minor changes that are associated with sporadic cases or small outbreaks, and antigenic shift, with more significant changes and the creation of new subtypes, which is responsible for large epidemics and pandemics [13-15].

Methodologies for extracting virus and nonviral antigens, and cancer vaccine development techniques allow further steps in understanding the role of viruses and the strategies of the immune system to produce humoral and cellular antibodies.

Peptide search in the tumor liberated protein and cancer proteomics represent the most advanced discovery in anticancer peptide vaccines [16].

Conclusion

The aim of the paper is to update extensively the HIV and the other viruses and to emphasize the role of PCR as laboratory test for the their identification.

Furthermore to give a general view of oncogenesis, particularly referring to the viral one, some latent and persistent infections are described, with details about influenza epidemics, the origin of AIDS, and also about oncogenes, immunological perspectives in oncology, and viral cancerogenesis, specially from Papillomavirus.

Peculiar relationship between EBV (Epstein Barr Virus) and immune system is mentioned as an example of both cellular division and neoplastic transformation [17].

Finally, mass vaccination against smallpox continues to be a leading initiative in Western countries to guard against bioterrorist attack.

Conflict of Interests

The author declares no conflict of interests.

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