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Review Article

Role of Viruses in the Biosphere (In Connection with Phenomena of COVID)

VB Sapunov*

European Geosciences Union, St. Petersburg Medical and Social Institute, Russian Federation

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***Corresponding author:** VB Sapunov, European Geosciences Union, St. Petersburg Medical and Social Institute, Russian Federation, E-mail: sapunov@rshu.ru

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Abstract

The purpose of the work is to consider the basics and methods of assessing the consequences for society of the unprecedented situation of 2020-2022 associated with the spread of the coronavirus infection and a set of reasonable and unjustified measures for its prevention. The problem can be considered in the context of fundamental sciences, such as biosphere ecology, the doctrine of the noosphere, and sociobiology. The principle of constancy, proposed by Vladimir Vernadsky, is of great importance. According to this principle, the biosphere is extremely stable, and even the most extreme influences cannot disrupt its equilibrium. From the standpoint of global ecology, the situation with the spread of the virus is a standard form of the relationship of species in the biosphere, and serious medical and biological consequences for humanity should not have occurred. However, the social consequences of infection were extremely high. The work is an attempt to quantify and qualitatively assess these consequences and identify ways to overcome the negative consequences of the spread of infections in the future. The basis for the development of such a strategy should be fundamental knowledge in the field of global ecology and the science of sociobiology, which studies the laws of the relationship between the social and biological components of man.

Introduction

In the spring of 2020, the world faced an unprecedented phenomenon - the spread of coronavirus infection on a global scale [1]. Strictly speaking, there was no epidemic as such. According to the norms of the World Health Organization and the Ministry of Health of Russia, an epidemic should be considered a disease of more than 5% of the population. This limit has not been exceeded in any region of the world. Nevertheless, the unconventional nature of the disease has forced the adoption of global quarantine measures, sometimes excessive. Prevention turned out to be politicized, which increased the negative consequences of the spread of infection and made it difficult to get an objective picture of what was happening. Were such measures justified? Let's try to filter out the political component of what happened and find out what happened, based on the synthesis of two sciences – global ecology [2] and sociobiology, which studies the laws of the relationship between the social and biological components of humanity [3,4].

Viruses in biosphere

In 1892, the Russian biologist D. I. Ivanovsky discovered the smallest organisms that cause diseases in plants "Virus of Tobacco Mosaic" (VTM). The scientist called such an organism a "filtering virus". Virus - in Latin, a poison or causative agent of the disease. Filterable – because it passes through the pores of those filters that hold other pathogens - protozoa, bacteria. And, of course, it passes through any mask. Viruses are a necessary component of the biosphere. These are the most numerous organisms on Earth. Some of them are also the most studied (for example, the famous bacteriophage T4 and VTM) due to their relative simplicity. Individual viruses can be collected and disassembled by scientists, and the viruses do not die [5]. But the level of development of modern molecular biology does not yet allow us to produce new viruses with the specified properties in laboratories. These tiny organisms perform important functions. The fact is that the gene pool of all living organisms is a single whole. The universal and unchangeable system of recording hereditary information

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genetic code, is practically the same in all organisms. This makes it possible to exchange information between any organisms, just as the unity of programming languages allows you to create global computer networks. The exchange of genes between all representatives of animals, plants, and microorganisms is ongoing. In addition to the fact that genes are passed from parents to children during reproduction, genes are passed between sexually incompatible organisms. This phenomenon, called "horizontal transmission," is necessary for the existence of the biosphere. It was first noticed by the American researcher Barbara Mc Clintoch. In 1983, she was awarded the Nobel Prize for her discovery [6]. These studies were supplemented by research by the Czechoslovak scientist Karel Slama, who showed that insects and plants have identical genes [7]. Theoretically, the possibility of the existence of a single information system within the biosphere was predicted at the beginning of the twentieth century by V. Vernadsky suggested the information union of biosphere [2]. The scientist proved that all organisms in the biosphere are constantly exchanging matter, energy, and information. The mechanism of information exchange was discovered after Vernadsky's death. During this time, molecular biology emerged and rapidly developed. It was this field of science that explored the phenomenon of horizontal transfer, its mechanisms, and its significance. Horizontal transport is one of the factors that ensures evolutionary progress and adaptation of organisms to environmental conditions. Moving from one organism to another, viruses can take genes from one place and leave them in another. Viruses are very numerous. The exact number of them on Earth is not known to anyone. Viruses evolve rapidly. One of the reasons for their rapid evolution is that they periodically capture the genes of higher organisms and carry them within themselves. Most viruses do not cause any diseases. All of us are constantly carrying a myriad of viruses. As long as the body works stably, this does not pose a danger. But in a weakened organism, the internal ecological balance can be disturbed. Then the internal parasites begin to multiply actively, causing the disease of the host organism.

Social and biological approach

The next approach that can be useful in understanding the role of viruses in general and the coronavirus in particular in biology is an approach based on the synthesis of biology and social sciences. Man belongs to two worlds. As a representative of the order of primates, it is part of the biosphere, i.e., a biological essence. As a rational and highly intelligent being, he enters the sphere of reason – the noosphere, and is a social essence. During social progress, the role of social components increases [2,8,9]. Accordingly, the spread of the virus, the health and survival are more dependent not so much on the harmfulness and dynamics of the virus itself, but on a social response to viral challenge. Inadequate prevention measures can be more harmful than the pathogen itself. The main theories describing the further development of the biosphere depending on anthropogenic influence are divided into two groups.

Theories of global crises, which are a development of neo-Malthusian, i.e., a modern edition of Malthus ' theory. These theories preach the inevitability of a series of global crises as the population grows and scientific and technological progress increases.

The theories of the cornucopia, asserting that the resources of the Earth and the resources of near space (for example, solar energy) are unlimited, exceed any growing needs of mankind.

Let's try to understand these theories. For this, it is necessary to recall the principles of global ecology, developed by Soviet scientists V. I. Vernadsky, G. F. Gauze, et al. [2,10].

1. There are no free ecological niches in nature.

2. The mass of living matter on Earth is relatively constant. It is 2400 billion tons (in dry mass, without water associated with living matter). Over hundreds of millions of years, this value has remained relatively constant. If in one place the biomass decreases, then in another it compensatory increase. Let us make a reservation that this statement of V. I. Vernadsky has not been proved with absolute accuracy. But the totality of environmental data indicates that this position is more true than false. Fluctuations in the mass of the biosphere, if they exist, are not significant.

3. The growth of biomass and abundance of any species is limited. This is a special case of the general philosophical thesis that no process can develop indefinitely according to the same law. The change in the number of any biological population goes through several stages - Figure 1. At the first stage, the number is unchanged. This stage was already known to ancient and medieval philosophers, most of whom were supporters of the idea of the immutability of the living world. At the second stage, an increase in the number of organisms is observed at a geometric rate. It was at this stage that Malthus drew attention. At the third stage, the stabilization of the number at the achieved level is again observed. This stage was described in 1838 by the Dutch naturalist P. Verhulst. Finally, the 4th stage may come, which was described on the basis of laboratory experiments in 1934 by G. Gause [10]. The essence of this stage is downsizing. Gause, working with laboratory cultures, observed a situation of complete disappearance of the population.

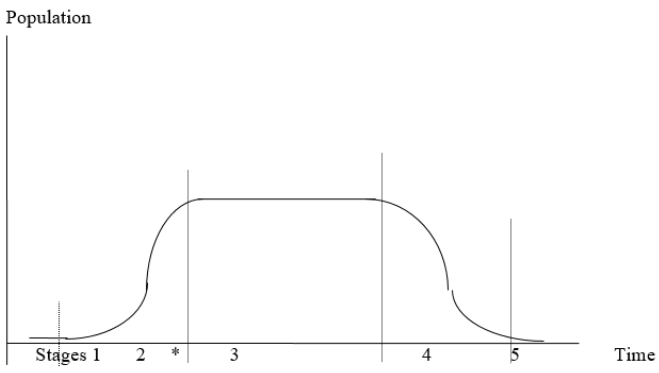

Figure 1: Dynamics of the population of every species, including man and viruses.

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Under natural conditions, there are usually no rigid boundaries of ecological niches, and some possibilities for the existence of a small population always remain. Therefore, it is more correct to lead the last part of the curve not to the intersection with the abscissa axis, but with some excess of the zero value. A population can turn into a "hidden" one, almost invisible by the methods of field ecology, but retaining its gene pool. This is the fifth stage of population growth, shown in Figure 1 a. Point * means modern state. When the ecological situation changes, the hidden population may begin to increase in number again.

Our future

During the fight against the semi-fake coronavirus, certain successes have been achieved in sanitation and health education. This should certainly have a positive effect on the incidence of infectious diseases. However, this positive aspect is outweighed by increased mortality from diseases caused by numerous stresses, as well as an increase in suicides. These are mainly diseases of the cardiovascular system and related mortality. So, in general, the consequences are negative. But humanity is a homeostatic system. It resists destructive pressure from the outside, regardless of whether this pressure is abiotic, biotic, or social in nature. The growth of mortality in the spring of 2020 may be partially compensated by the growth of fertility in 2021 - 2024, which will inevitably lead to the regime of "self-isolation". And then it will be possible to trace the further dynamics of the Earth's population.

Is there any profit from COVID?

As we have seen, viruses are an integral part of the biosphere. It makes no sense to talk about whether they are useful or harmful. Each organism takes its place and works for a great goal - the preservation of the biosphere as a whole. Of course, diseases and epidemics can negatively affect both individuals and humanity as a whole. However, to a certain extent, infectious diseases are also necessary to maintain the homeostasis of the human population. As you know, to maintain the combat capability of the army, it is necessary that it periodically participate in small wars. Big wars are too dangerous and can destroy both the army and the country. But armies need small wars; otherwise, they will not learn how to fight. Also, the body's immune system needs a periodic fight against external infection. This activates the immune system, making it more resistant. Therefore, diseases such as acute respiratory illness, influenza, and influenza pneumonia have not only negative but also positive consequences. They increase the viability of the population, maybe even at the cost of the extinction of some of the unhealthy individuals. The species strives for survival, discarding less-adapted individuals. The biosphere preserves itself as a whole at the cost of discarding less-adapted species. The body preserves itself by getting rid of some of the leukocyte cells. It is known that after a not-so-dangerous respiratory illness, as a result of complete recovery, people generally have higher fitness scores. All this requires a reasonable attitude to viral infections, taking into account the laws of existence of the species and the biosphere.

Conclusion

The spread of coronavirus infection from early 2020 to 2022 is certainly a tragic moment (precisely a moment, not a period) in world history. The tragedy is amplified by the negative social processes and phenomena that have accumulated in society by now. The mortality rate increased, but the main component came not from infections but from stress-induced cardiovascular diseases as a consequence of errors in social policy, which corresponds to the general dynamics of demographic processes on the Earth [10,11]. The development of preventive medicine and improvement of the health care system should be considered positive aspects. The negative consequences nevertheless outweigh. Humans and humanity as a whole are homeostatic and homeorese (possibility to have a solid direction of development) systems [12]. Some compensation for the effect of increased mortality in the first half of 2020 can be provided by a rise in the birth rate in early 2021 - 2023. It is impossible to fully predict all the consequences of this situation at the time of writing. Undoubtedly, they will be negative, but partially compensated by the homeostatic capabilities of the noosphere. What will be the state of the new generation coming after 2020 can, to a certain extent, be predicted on the basis of methods of fundamental science and phenogenetic indication [13]. The main conclusion should be that the biosphere has active mechanisms of homeostasis, and it can compensate for any negative external effects of abiotic, biotic, and social origin.

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