Virus origin could relate to the act of prey among primitive life forms.

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Abstract. Viruses could have originated from the frantic competition to survive among primitive life forms. This is the result of this new hypothesis which proposes that viruses could have originated as remnants of the disintegration of primitive microorganisms. The disintegration can have resulted from an attack of other cells for the purpose of nutrition or imposing control on the nutritional sources. This view is conclusive and can replace old hypotheses and additionally, it is flexible and explains virus diversity.

Keywords: virus origin, cell disintegration, progeny vacuole

1 Introduction:

The origin of viruses and their evolutionary relation with other cellular microorganisms are enigmatic. Three main hypotheses have been articulated to track this problem:

1.1 The virus first hypothesis:

It postulates that viruses existed in a precellular world as self-replicating units. Over time, these units became more organized and more complex. Eventually, enzymes for the synthesis of membranes and cell walls evolved, resulting in the formation of cells [1].

1.2 The reduction hypothesis:

It proposes that the existing viruses may have evolved from more complex, possibly free-living microorganisms that lost genetic information over time, as they adopted a parasitic approach to replication [2]. This hypothesis is supported by the fact that the bacteria Rickettsia and Chlamydia are living cells that, like viruses, can reproduce only inside host cells. Their dependence on parasitism is likely to have caused the loss of genes that enabled them to survive outside a cell.

1.3 The escape hypothesis:

According to this hypothesis; viruses originated from bits of mobile genetic elements, RNA or DNA, that from the genes of larger microorganisms [3]. The escaped DNA could have come from plasmids or transposons [4], while the escaped RNA could have come from retrotransposons [5].

By checking these three hypotheses, we can find that, none of which was fully accepted. The virus-first hypothesis was usually rejected firsthand, since all known viruses require a cellular host. It clashes with the cellular theory of life and the traditional assumption that viruses are nonliving entities [6]. The reduction hypothesis does not reconcile with the observation that the most reduced cellular parasites in the three domains of life do not look like the intermediate forms between viruses and cells. The escape hypothesis does not explain the complex capsids and other structures on virus particles. The three hypotheses have undergone a process of re-evaluation, but this new hypothesis seeks to provide a conclusive concept.

2 Hypothesis:

This new hypothesis postulates that viruses could have originated as remnants of the frantic competition to survive among the primitive life forms. The act of prey spread among them for the purpose of nutrition or imposing control of the natural resources. They used various mechanisms to target each other, leading to the disintegration of the prey microorganism in favor of the predator microorganism which may consume the remnants as a source of nutrition. Thus, these remnants gain access to the predator microorganism. Under the effect of probability; some of these remnants contain a genetic material valid for reproduction.

These primitive life forms developed many strategies to perform the act of prey. The passive strategy was the simplest, in which the predator cell engulfs the remnants of other cells that disintegrate independently either due to intrinsic factors or extrinsic unfavorable environmental conditions. The active strategy was more complicated, as the predator cell contributes in the process of prey cell disintegration. The release of chemicals to induce or encourage the prey cell disintegration was a favorable wide spread technique (as shown in Figure 1).

The disintegration process involves the sequential breakdown of cellular components, including the genetic material. The disintegration results in vacuoles packed with cellular components of the prey cell. Some of these are progeny vacuoles and contain genetic material. The predator cell contacts the progeny vacuoles to engulf them. During this reaction; the genetic material gain access to the predator cell. Some of the genetic material gets the ability to self-replicate inside the predator cell and others can't. The predator then turns to be the host

cell for the new self-replicate genetic material (as shown in Figure 2).

The self-replicating genetic materials use the host cell mechanisms to replicate, forming new viruses. The new viruses bud from the cell membrane to attack new hosts. In another scenario; the host cell disintegrates, either due to intrinsic factors or extrinsic unfavorable environmental conditions. The disintegrated cell releases the newly-formed viruses and may release new progeny vacuoles which contain self-replicating genetic material. These genetic material can contain a mixture of the host cell genetic material coupled with the prey cell genetic material, forming new- type virus (as shown in Figure 3).

3 Supporting Argument:

This proposed hypothesis has supportive advantages over the old theories, as follows:

3.1 Conclusiveness:

This hypothesis is conclusive as it can explain the origin of both RNA and DNA viruses, or the origin of the viruses of the three domains of life: Archaea, Bacteria and Eukarya. The presented hypothesis gives an acceptable illustration of the origin of viruses and avoids the defect of the other hypotheses.

The reduction hypothesis does not explain the fact that the most reduced cellular parasites in the three domains of life do not look like the intermediate forms between viruses and cells. The previous fact does not relate to the present hypothesis as it depends on the act of prey among primitive life forms in the genesis of viable genetic material that capable of self-replicate inside a host cell.The escape hypothesis fails to explain the complex capsids and other structures on virus particles. The progeny vacuoles described in the present hypothesis, which results of prey cell disintegration, can contain a viral structure at any level of complexity.

The present hypothesis can illustrate the origin of Prions, which are transmissible self-replicating proteins. The hypothesis depends on the action of probability that the produced progeny vacuoles of the disintegrated prey cell would produce a self-replicating material inside a host cell. It does not specify the type of the transferred material which is transferred passively during the act of prey.

3.2 Dynamic and Flexible:

Two factors enhance the flexibility of the present hypothesis:
First is the action of probability, which lies in the heart of the present hypothesis. It would result in a large variety of viable progeny vacuoles during the continuous act of prey among the primitive life forms. These viable vacuoles

would in turn produce highly diverse types of viruses. However; the action of probability was trimmed by the action of natural selection, the result would still be highly diverse. Second is the action of prey itself, which is dynamic by nature. The predator host cell can engulf multiple progeny vacuoles before being disintegrated and preyed by another cell and so on. This action leads to genetic material mix-up.

Virogenesis, according to this hypothesis, diminishes as the primitive life forms evolve to be more complex. The probability of forming viable progeny vacuole diminishes. The disintegration of a more complex unicellular organism will produce multiple vacuoles containing various cellular components packed within, less of them and may be none, will be a viable progeny vacuole.

4 Conclusion:

This new hypothesis proposes that viruses could have originated from the frantic competition to survive among the primitive life forms of the old ages. The act of prey among these forms may result in viable progeny vacuole that is capable of self-replication inside a host cell. This new hypothesis is more conclusive and avoids the defects of other hypothesis.

5 References:

1. Koonin, Eugene V., and William Martin. "On the origin of genomes and cells within inorganic compartments." TRENDS in Genetics 21, no. 12 (2005): 647-654.

2. Dimmock, Nigel J., Andrew J. Easton, and Keith N. Leppard. Introduction to modern virology. John Wiley and Sons, 2016.

3. Cushion, M. T., A. Balows, and M. Sussman. "Topley and Wilson's microbiology and microbial infections." Topley and Wilson's Microbiology and Microbial Infections (1998).

4. Shors, Teri. Understanding Viruses. Jones and Bartlett Publishers, 2011.

5. Cann, Alan J. Principles of Molecular Virology (Standard Edition). Academic Press, 2001.

6. van Regenmortel, Marc HV, and Brian WJ Mahy, eds. Desk encyclopedia of general virology. Academic Press, 2010.

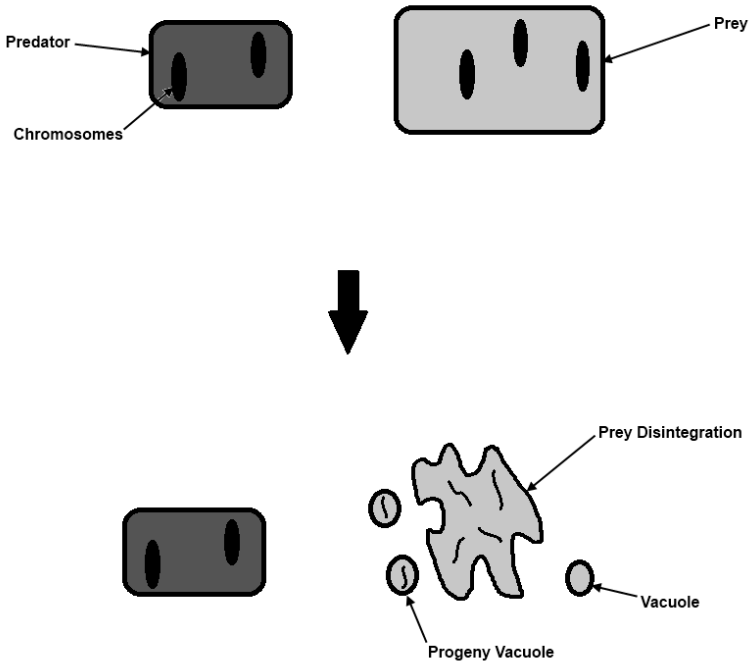

Fig. 1. The act of prey

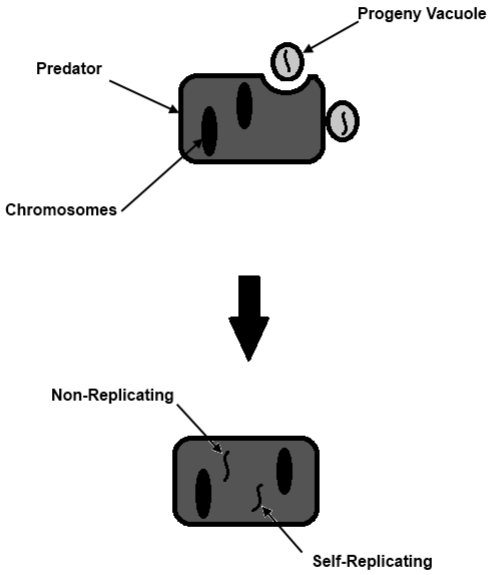

Fig. 2. The act of prey

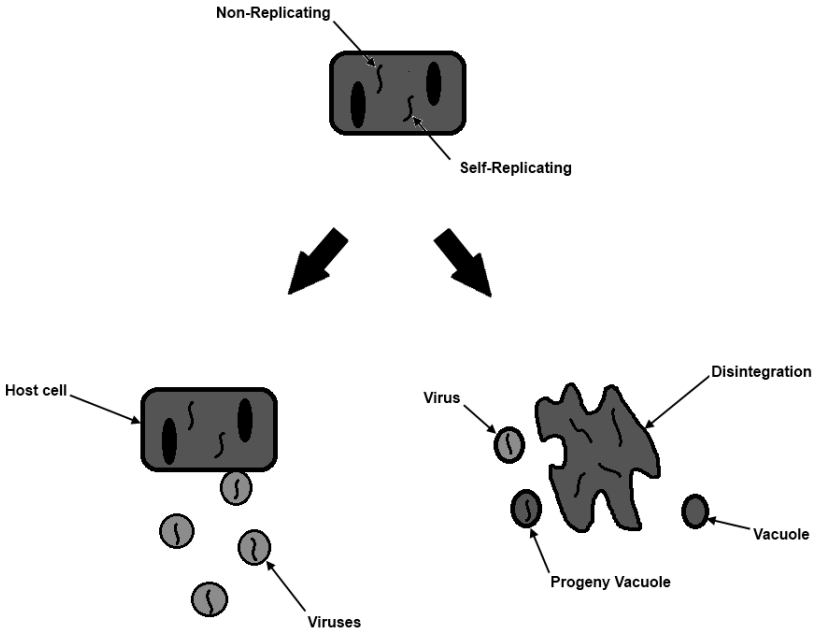

Fig. 3. The act of prey