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Viruses are viruses: Keys to understand its difference with microorganisms

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Abstract

Although the study of viruses is vertiginous, the study of microorganisms, such as bacteria, is also dizzying. However, they are different, both in structure and in the way they form offspring, although both may be involved in the generation of infectious diseases, both in animals and in humans.

Viruses are viruses, sentence attributed to André Lwoff (Nobel Prize winner in 1965) denotes the, because although at first, they were considered similar to a poison or toxin, since they did not follow Koch's postulates, today we know much more about them and in particular how they form offspring, their taxonomy and how there is an international committee dedicated to their study and variations over time.

Keywords: Virus detection; Threat; Microorganisms; Binary fission

1 Introduction

In general, pathogens include bacteria, fungi, parasites, prions, and viruses. Except for prions, all the others have a genome made up of DNA or RNA (some viruses), which is why currently the technique devised by Kary Mullis is so important at the time of detection and identification of any of them [1].

However, long before it was suspected that there was "something" that caused disease but that did not follow Koch's postulates. Thus, one of the first diseases associated with vegetables hit the spot. A German chemist, Adolf Mayor noticed a strange disease in tobacco leaves, later a Russian biologist, Dimitri Ivanosky was able to generate the disease in healthy tobacco leaves from a filtered juice prepared with diseased leaves, but it was Benjerinc, a Dutch microbiologist who, after making dilutions of it, was able to establish the extent to which that poison or toxin could generate the disease. Thus, a new discipline was born: virology [2].

The fact that the viruses passed through the finest filters that retained the smallest bacteria known until then was only one of the viral characteristics put in evidence and for many years the value of 300nm was the limit to separate them. However, today it is known that there are bacteria as small as 20 nm and viruses as large as 800 nm. Therefore, *viruses are viruses,* it does not point precisely to this "difference" in size [2, 3].

2 Material and methods

"Viruses are viruses" and *"viruses replicate exclusively within living cells"* are two sentences written in bronze. The first fundamentally points to the way in which viruses form offspring, dispensing with binary fission, which is typical of bacteria and other microorganisms. No, viruses do not reproduce…they multiply or replicate exclusively inside living

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cells. That is why the achievement of Enders, Weller and Robins in 1949, who succeeded in isolating the polio virus by establishing cell cultures (they were awarded the Nobel Prize in 1954), is so important [4].

The distinctive nature of the viruses had already been confirmed with the study of Stanley who managed to crystallize the tobacco mosaic virus for the first time in 1935 and who for his studies won the Nobel Prize in 1946 [4].

So far no viral features associated with the electron microscope, which allows viruses to be seen, have been mentioned. The truth is that viruses are submicroscopic, but their effect can be seen in the cells they infect with a light microscope, mainly the cytopathic effect of cell lysis associated with some viruses. Today it is known that there are bacteria (called rickettsia) that also comply with the second sentence applicable to viruses, but not the first. *Viruses are viruses,* still.

Electron microscopy has undoubtedly contributed its own, mainly in the face of the emergence of an emerging virus and the suspect can be "located" in some sector of the viral taxonomy. Precisely, because there are even some viruses that have been named for some morphological characteristic such as *coronaviruse*s... does it sound like you?

3 Results and discussion

In general, the genome of viruses is much smaller than that of bacteria. An RNA virus has a genome that varies between 5 and 22 thousand bases; a DNA virus has a genome that varies between 2 and 200 thousand bases, while the bacterial genome can reach the not insignificant sum of 4 million nucleotide bases. Perhaps for this reason, viruses only encode their structural proteins and partly their non-structural proteins, taking advantage of all the biosynthetic machinery at their disposal, when infecting a cell [2, 3].

Viruses do not follow the strategy of binary fission and today it is known that the viral cycle includes a stage of adsorption to the cell to be infected mediated by cell receptors, later it enters the cell depending on the type of virus in question (RNA or DNA) and the genome remains at the disposal of both its own and cellular enzymes that will synthesize both viral proteins and copies of the viral genome. Subsequently, the viral assembly is carried out, which produces an untold number of new viral particles that, if they are complete, constitute the virion that will come out of the infected cell, sometimes destroying it: *Viruses are Viruses* [2, 3].

How to detect them? Well, several of them cause viremia, that is, they "transfer" in the blood of the infected person, others after entering the body can lodge in a specific organ, which will determine the sampling. If we take SARS-CoV-2 as an example, we must take a saliva sample or through a nasal swab and perform a variant of the technique wonderfully described by Kary Mullis, RT-PCR [2].

RT from *Reverse Transcription*, thus incorporates a stage prior to PCR where the substrate must be synthesized, since SARS-CoV-2, like VDC (Canine Distemper Virus, for example) is an RNA virus. If the sample is positive, this result can be sequenced and compared with the different sequences that originate the different variants of this virus [5, 6, 7, 8]

It is a dizzying story, especially if we consider SARS-CoV-2, which still has us in check, despite having synthesized some vaccines. *Viruses are viruses*. The brilliant idea of Kary Mullis has made it possible to detect monkeypox virus and other viruses that affect animals, even in our third world laboratory [9 ,10, 11, 12].

4 Conclusion

It is not necessary to crucify some academic/student who maintains that viruses are microorganisms, you just must induce him to read an article like this one. But it is our mission to also clarify -for example- that SARS-CoV-2 is not the same as COVID19, or that Canine Distemper Virus is not the same as Canine Distemper. One is the pathogenic agent and the other is the associated disease. https://www.youtube.com/watch?v=xNgTMDRoa60.

Compliance with ethical standards

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