Destruction of Viral Capsids by means of Specific Violet Radiation

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I show here that Viral Capsids can be easily destructed by means of a specific *violet* radiation. This possibility is extremely advantageous from the technical viewpoint, because can be very efficient to destruct viral capsids at the air, on the skin or on the oral mucosa, for example.

Key words: Virus, Viral Capsids, Viral Capsids Destruction.

INTRODUCTION

Viruses can be extremely simple in design, consisting of nucleic acid surrounded by a *protein* coat known as a *capsid*. The Viral Capsid is made of many smaller, identical protein molecules called capsomers [1].

Here, we show that the Viral Capsid can be easily destructed by means of a specific *violet* radiation. This possibility is extremely advantageous because can be very efficient to destruct viral capsids at the air, on the skin or on the oral mucosa, for example.

THEORY

When a photon incides on a Viral Capsids it incides on a protein molecule (capsomers), which is basically composed of atoms of Hydrogen, Carbon, Oxygen and Nitrogen.

The chance of the incident photon reach on atoms of Hydrogen, Carbon, Oxygen and Nitrogen is extremely high. The approximate sizes of these atoms are given, respectively, by the following values, $\phi_H = 50\,pm$, $\phi_C = 150\,pm$, $\phi_O = 120\,pm$ and $\phi_N = 130\,pm$.

The pressure, p, which a photon, with energy hf, produces when it incides on one of these atoms can be expressed by:

$$p = \frac{F}{S_{atom}} = \frac{hf/\lambda}{S_{atom}} = \frac{hc}{\lambda^2 S_{atom}} \qquad (1)$$

Thus, the *minimum* pressure, $p^{\min}$, is produced when the photon incides on the atom with *largest* area ($S_{atom}^{\max} = \pi\phi_{\max}^2/4$), i.e.,

$$p^{\min} = \frac{4hc}{\pi\phi_{\max}^2\lambda^2} \qquad (2)$$

The maximum diameter of the atoms of Hydrogen, Carbon, Oxygen or Nitrogen, is. $\phi_{\max} = \phi_C = 140\,pm$. Therefore, Eq. (2) can be rewritten in the following form:

$$p^{\min} = \frac{4hc}{\pi\phi_{\max}^2\lambda^2} = \frac{1.1\times10^{-5}}{\lambda^2} \qquad (2)$$

On the other hand, the *maximum rupture pressure* supported by a Viral Capsids is approximately $550atm \cong 5.6\times10^7\,N/m^2$ [2]. Thus, all types of Viral Capsids will be effectively destructed if

$$p^{\min} = \frac{1.1\times10^{-5}}{\lambda^2} > 5.6\times10^7\,N/m^2 \qquad (3)$$

Equation (3) tells us, therefore, that photons with wavelength

$\lambda < 4.4\times10^{-7}\,m = 440nm$ can destruct all types of Viral Capsids.

However, we cannot consider the spectrum radiation with $\lambda < 380nm$, because are very dangerous radiation. (380nm is the inferior limit of the violet spectrum. Below this value is the beginning of the UVA spectrum). Then, only remains the following spectrum

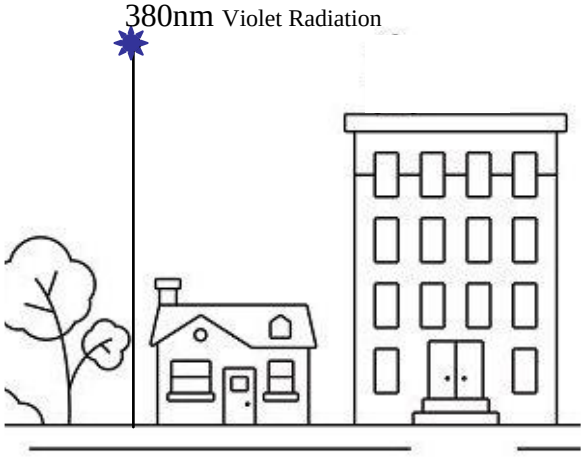
$380nm - 440nm$.

This is also the spectrum of *violet* light ($380nm - 440nm$).

CONCLUSION

The radiation with $380nm$ wavelength appears to be the most efficient in destroying Viral Capsids. An important characteristic of this radiation is that *it is not visible* to most people; in addition, it can penetrate in the human skin, 0.1mm – 0.2mm, only and is not dangerous for the peoples.

The idea is to use this radiation in order to eliminate viruses in the Earth's atmosphere, inside home and, in buildings, etc.



REFERENSES

[1] *Collier L, Balows A, Sussman M, eds. (1998). Topley & Wilson's Microbiology and Microbial Infections. Vol. 1, Virology (9th ed.). pp.33-55.*

[2] Purohit, P.K, Kondev J., and Phillips, R., (2003) *Mechanics of DNA packaging in viruses*, *Proc. Natl. Acad. Sci. U.S.A.* 100 (6) 3173-3178, https://doi.org/10.1073/pnas.0737893100