Solar UV Treatment of Covid-19 by Nanoparticles

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I. Introduction

Covid-19 vaccines differ from the traditional. In Moderna, the patient receives an injection of mRNA that encodes the virus spike protein and once inside the patient's body produces the antigen to elicit immunity.

However, mRNA molecules are fragile and disintegrate upon entering the cell making mRNA unsuitable as a therapeutic. Research showed mRNA is a workable therapeutic by delivery to the cell inside lipid nanoparticles (NPs). Moderna uses ~ 80 nm NPs. Pfizer/BioNTech uses larger lipid NPs, but actual NPs data are proprietary and not known to the public.

II. Problem and Purpose

The problem is simple QED theory predicts NPs emit EM radiation depending on NP size. For Moderna's ~80 nm NPs, the UVC is produced that at body temperature inactivates or at least degrades the mRNA before ever reaching the cell. Therefore, the mRNA has nothing to do with the success of the Moderna vaccine

Early-on, Moderna reported a remarkable 94.5% efficacy compared to 50% efficacy of traditional vaccines. Since UV inactivated the mRNA, what produced Moderna's high efficacy?

In late 2020, Covid-19 side effects (muscle pain, etc) in animals were shown caused [1] by NPs without mRNA. But the cause of NP induced side effects was not known. Simple QED explains side effects by the NPs emitting UV radiation that excites muscle and brain neurons which may also explain high vaccine efficacy.

Since the mRNA is inactivated, the success of Moderna and others have inadvertently proven that the UV radiation from NPs is somehow providing > 90% efficacy against Covid-19. The purpose of this short paper is to answer the question,

How does the UV do this?

III. Solutions

Mid-2020 Version

Treat only Covid-19 patients tested positive having the live virus in their bodies. The UV only needs to inactivate a few virions in the patient that then act as the antigen to elicit Covid-19 immunity for inactivating the remaining virus in their body, but the high efficacy of Moderna for patients tested both positive and negative suggests NP induced UV efficacy has nothing to do with the patient having Covid-19 virions in his body.

Mid-2021 Version

The NP treatment was revised based on solar UV converting 7-DHC in the skin to Vitamin D3 consistent with [2,3] showing > 90% of Covid-19 deaths correlated by Vitamin D deficiency. Unlike Covid-19 virions which are in ultra-low concentration in the bloodstream even in patients tested positive, the UV from NPs over the very large area of skin of all patients is far more likely to explain Moderna's > 90% efficacy. Solar UV passes through the epidermis to reach 7-DHC. NPs reach the 7-dehydrocholesterol (7-DHC) in the sub -dermal skin by arterial and venal blood capillaries as illustrated in Fig. 1.
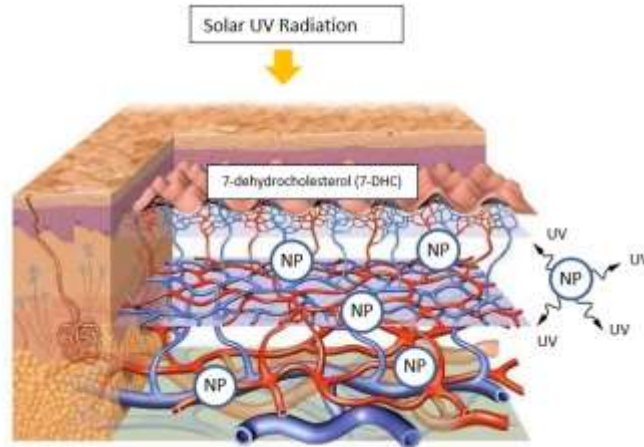

Figure 1. NPs in Capillaries at 7-DHC

For illustration, Fig. 1 depicts the NPs larger than the capillaries, but the NPs << capillary diameters allowing the NPs to reach the sub-dermal 7-DHC. The NPs emit UV that reacts with 7-DHC in basal epidermis [2] to produce Vitamin D3 which is converted in the liver into 25(OH)D the circulating metabolite. The kidneys convert 25(OH)D into bioavailable 1,25(OH)2D promoting immune regulatory T cells. Vitamin D protects against infectivity [3] from COVID-19 and deficiency in 25(OH)D is correlates with positive Covid-19.

IV. Simple QED

Simple QED is a method of nanoscale heat transfer that conserves heat with EM radiation instead of temperature. Based on the Planck law of quantum mechanics, simple QED allows UV to be produced at body temperature to synthesize Vitamin D3 from 7-DHC

Classical physics allows atoms in NPs to have heat capacity to conserve heat by a change in temperature. Creating a UV photon requires high temperatures, $T = E/(3/2\ k)$. In the UVC at 254 nm, $T \sim 37{,}000$ K which is not possible in the human body.

However, heat transfer in NPs is controlled by the Planck law of quantum mechanics differing significantly from classical physics by denying atoms the heat capacity to conserve heat by a change in temperature. The Planck law precludes NP temperatures required for Fourier heat conduction, i.e., heat flux Q cannot penetrate the NP surface by conduction. Conservation of Q may only proceed by creating non-thermal EM waves carrying the heat Q across and back the NP diameter d in time $\tau = 2nd/c$. At this instant, a photon is created having Planck energy E,

$$E = h/\tau = hc/2nd$$

$\lambda = 2nd$, where n = refractive index

V. EM Confinement

Brief EM confinement of absorbed heat Q at the NP surface is necessary to form standing EM waves. Inward disposed Poynting vector S = heat Q flux $\sim W/m^2$ provides momentum I as EM confinement. For $Q \sim W/m^2$, the NP absorbs $U = \pi d^2 Q \sim J/s$. Since momentum $I \sim U/c \sim Nt\text{-}s$, I/s gives the EM confinement force $F \sim Nt$.

VI. UV Intensity

The UV intensity is the number N of UV photons/s, N = Q/E. For body temperature T = 37 C = 310 K, the Stefan-Boltzmann equation gives the heat Q transferred from the surroundings at 310 K to the NP that by the Planck law approaches absolute zero, $Q \sim \pi \sigma d^2 T^4$. For Moderna vaccine having d $\sim$ 80 nm, the heat $Q = 1.05 \times 10^{-11}$ W = 10.5 pW. Lipid NPs having n = 1.6 give $\lambda = 2nd \sim 254$ nm which is in the UVC with $E = 7.80 \times 10^{-19}$ J or 4.88 eV. Hence, the NPs emit $N \sim 1.35 \times 10^7$ UVC photons/s.

Moderna and other Pharma's do not give the number N_{NP} of NPs/dose. Assuming 1 mg of lipids in a Moderna 0.5 ml dose having the density of water, the total lipid volume $V_L = 1000 \times 10^{-12}$ m^3. The volume $V = \pi d^3/6$ of a single 80 nm NPs is 2.68×10^{-22} m^3. Hence, the number N_{NP} of NPs/dose is, $N_{NP} = V_L/V \sim 3.73 \times 10^{12}$ giving the total number N_P of UVC photons/dose, $N_P = N \cdot N_{NP} = 5 \times 10^{19}$ UVC photons/s having a total UVC power of about $\sim$ 40 W. The surface area of human skin is 1.7 m2 giving a NP induced UVC flux 23.5 W/m^2.

Solar radiation on the Earth's surface on a cloudless sky is about 1050 W/m^2. Solar UVC radiation is not present on the Earth's surface while UVB radiation (280-350 nm) is 5% of the total or 50 W/m^2 as shown in Fig. 2.
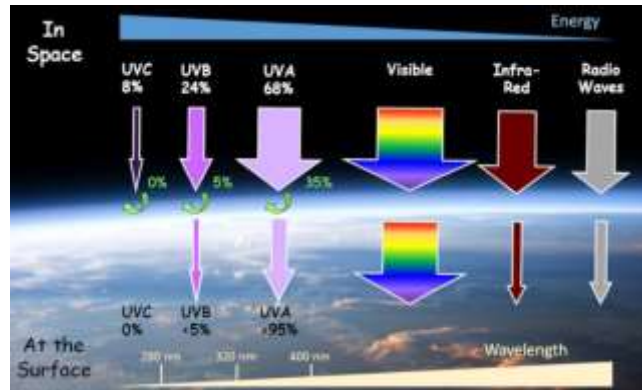

Figure 2. Solar Radiation on Earth's surface

UVC aside, the NP induced UV flux a single injection of Moderna is comparable to the solar UVB on the Earth's surface. What this means is NP induced UV is a reasonable Covid-19 therapeutic. DNA damage does occur, but based on the success of Moderna is not important. However, the FDA is required to control NP size with a tight tolerance to 80 nm.

VII. Conclusions

In Covid-19, the promise of mRNA vaccines in decoding the spike protein at > 90% efficacy cannot be fulfilled as the ~80 nm NPs that carry the mRNA emit UVC radiation that inactivate the mRNA before reaching the cell.

NPs alone provide the > 90% efficacy in Covid-19 immunity

To explain the success of Moderna w/o mRNA, the NP treatment was proposed in mid-2020 for patients tested positive, the NPs emitting UV to create antigens from Covid-19 virions in the patient's body. But the success of Moderna for patients tested negative suggests another mechanism is producing high efficacy.

 In mid-2021, data correlating Vitamin D3 deficiency with Covid-19 suggested exposure to solar UV is preventive therapy for all Covid-19 patients. Therefore, the 2021 NP treatment using the UV from NPs is proposed to synthesize Vitamin D3 from 7-DHC in the skin, and if so,

Moderna's claim of protection for the Delta variant is likely correct.

Early estimates of heat absorbed by the NPs are grossly incorrect giving 7 UVC photons/NP/s. The Stefan-Boltzmann equation on transferring heat from the surroundings at 310 K to the NP at absolute zero is significantly higher than the Planck radiation law giving 1.35×10^7 UVC photons/NP/s.

Comments are requested.

References

[1] Wadman M. [2020] "Public needs to prep for vaccine side effects", Science 370 (6520), 1022.

[2] Brenner H. and Schottker B. [2020] Vitamin D Insufficiency May Account for Almost Nine of Ten COVID-19 Deaths: Time to Act. Nutrients 2020, 12(12), 3643.

[3] Charoenngam N., et al. [2021] Vitamin D and Its Potential Benefit for the COVID-19 Pandemic Endocrine Practice https://doi.org/10.1016/j.eprac.2021.03.006