Nanoparticles and efficacy of mRNA vaccines

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Abstract: The CDC approach to the Covid-19 virus was traditional: quickly develop a vaccine that usually takes years, but even if successful in the near term is impossible to implement for the entire World population, let alone unacceptable because of attendant social unrest and economic collapse. On this basis alone, the traditional approach for Covid-19 is not likely to be successful. Moreover, vaccines typically contain fragments of inactivated viruses. In this regard, the current Pfizer/Biotech and Modern vaccines differ in that the inactivated virus is not used, but rather the patient receives an injection of genetic material –mRNA– that encodes the spike protein of Covid-19 virus as the antigen to elicit Covid-19 immunity, the process taking place inside the patient's body. Since the mRNA molecule is fragile and disintegrates upon entering the cell, the mRNA is dispersed inside ~ 80 nm fatty lipid nanoparticles (NPs). Unfortunately, the ~80 nm NPs emit UVC radiation that inactivates the mRNA carried making the promise of mRNA vaccines in the therapy of disease unworkable. But the mRNA vaccines by Pfizer/Biotech and Modern are reported to have a 94.5% efficacy clearly suggesting a mechanism other than mRNA is inactivating the Covid-19. In this regard, the Covid-19 NP Treatment based on NPs inducing UVC was proposed in mid-2020 as the mechanism to avoid obvious logistical problems in the World-wide delivery of cold storage requirements of Covid-19 vaccines. In the Covid-19 NP Treatment, the UVC need only inactivate a few of the live Covid-19 virus in the patient that then act as the antigen to elicit Covid-19 immunity. But UVC also damages DNA of neurons in the brain. Low NP doses reduce UVC levels to allow correction of DNA damage by repair systems. Currently, NP doses are too high as Bell's palsy and allergic reactions are reported. The concept of mRNA vaccination can be made workable if NPs > 100 nm producing IR radiation carry the mRNA as IR would not inactivate mRNA, but then efficacy is reduced to ~50% compared to the NP Treatment offering > 90% efficacy at low cost without need of mRNA and attendant cold storage.

Keywords: Covid-19, Planck law, simple QED, nanoparticles, treatment, vaccine efficacy

I. INTRODUCTION

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In 2020, the Coronavirus known as Covid-19 became a pandemic that changed [1] the economic future of the world, although in severity only comparable to influenza. Since there was no vaccine or specific treatment known for Covid-19, the CDC approach was traditional: quickly develop a vaccine that usually takes years, but even if successful in the near term is impossible to implement for the entire World population, let alone unacceptable because of attendant social unrest and economic collapse. On this basis alone, the traditional CDC approach for Covid-19 is not likely to ever be successful.

Moreover, vaccines typically contain fragments of inactivated viruses. The current Pfizer/Biotech and Modern vaccines differ in that the inactivated virus is not used, but rather the patient receives an injection [2] of genetic material –mRNA– that encodes the virus protein *thought* to be the antigen necessary to elicit Covid-19 immunity, the process taking place inside the patient's body. For Covid-19, the spike protein was selected as encoding all proteins in the virus is difficult, if not impossible.

Making matters worse, the mRNA molecule is fragile and disintegrates upon entering the cell, the difficulty *thought* resolved by dispersing [3] the mRNA inside fatty lipid nanoparticles (NPs). Unfortunately, simple QED theory [4] claims the NPs emit UVC radiation that inactivates the carried mRNA, thereby negating [5] the concept of mRNA vaccines in NP carriers.

Nevertheless, the Pfizer/Biotech and Modern vaccines are reported [6] to have a remarkable 94.5% efficacy in protecting against Covid-19. UVC inactivation of mRNA aside, influenza vaccines based on inactivated virus have only 50% efficacy. Since Moderna's Covid-19 mRNA vaccine is the genetic equivalent of an inactivated Covid-19 spike, the efficacy of the Covid-19 mRNA vaccine should be near 50% - not over 90%.

In this regard, the Covid-19 UVC Treatment proposed [7] as an alternative to the logistical problems in the World-wide delivery of cold storage mRNA vaccines also explains the 90% efficacy without mRNA.

Based on the long history of UV inactivating viruses, simple QED theory applied to ~80 nm lipid NPs injected in the patient showed low levels of UVC radiation could be produced, the UVC only needing to

inactivate a few of the virus in the patient that then act as the antigen to elicit Covid-19 immunity, i.e., the UVC from NPs carrying the mRNA is the mechanism for the 90% efficacy.

However, the UVC from NPs has a dark-side. The NPs in injections rapidly enter the brain, the UVC causing collateral DNA damage to neurons. Low NP doses allow correction of DNA damage by repair systems. But if NP doses are too high, DNA repair systems are overwhelmed and neurological symptoms appear. Since Bell's palsy [8] and neuronal allergic modulations [9] have already been reported, DNA damage from mRNA vaccines should be included with vaccine efficacy as NP doses are likely too high.

Nevertheless, the Pfizer/BioNTech and Moderna vaccines have received CDC/FDA approval [10] and are now are in the process of being distributed around the World even though the vaccines may be ineffective [11] against Covid-19 variants.

Since there are 8 billion people in the World and cold storage temperatures for the Pfizer/ BioNTech and Moderna mRNA vaccines aside, it is still unlikely to be given to everyone. As in mid-2020, the Covid-19 UVC Treatment is once again proposed as an alternative to mRNA vaccines.

II. PURPOSE

The purpose of this paper is to reiterate the mid-2020 proposal [6] of the NP Treatment for the Covid-19 and future pandemics. Only ~80 nm lipid NPs are used - no mRNA. The NPs injected in Covid-19 patients provide UVC within the human body to disinfect the virus as shown in Fig. 1.

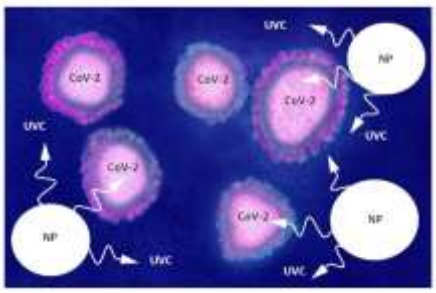

Figure 1. UVC Treatment by nanoparticles

III. BACKGROUND AND THEORY

Simple QED is a nanoscale heat transfer process based on the Planck law [12] of quantum mechanics (QM) differing significantly from that of classical physics. Research in nanoscale heat transfer [13-15] has been reported. But despite advances, there are still challenges in understanding the mechanism of nanoscale thermal transport. Perhaps, researchers have not appreciated the significant difference between classical physics and the Planck law with regard to the heat capacity of the atom illustrated in Fig. 2.

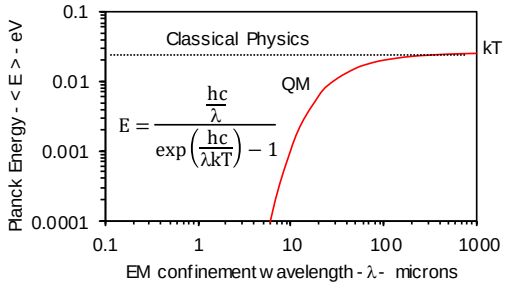

Figure. 2: Planck law of the Atom at 300 °K
In the inset, E is Planck energy, h Planck's constant, c light speed, k Boltzmann's constant, T temperature, and λ the EM wavelength.

The Planck law at 300 K shows classical physics allows the atom constant kT heat capacity over all EM confinement wavelengths λ. QM differs as the heat capacity of the atom decreases for λ < 200 microns, and vanishes at the nanoscale for λ < 100 nm.

Indeed, the Planck law denies atoms in nanostructures the heat capacity to change temperature upon the absorption of heat - a difficult notion to accept because of our training in classical physics. QM requires heat transfer to occur without changes in temperature.

Nevertheless, nanotechnology has continued [13-15] to use classical physics at the nanoscale. In effect, the Fourier law of heat conduction commonly used in nanoscale heat transfer is no longer valid. The Stefan-Boltzmann law for radiative heat transfer depending on temperature is not valid at the nanoscale. Classical Molecular Dynamics (MD) simulations [16] under periodic boundary conditions (PBC) provide the atomic response to the thermal disturbances in macrostructures are clearly valid where atoms do indeed have temperature. However, classical MD extensions to discrete nanostructures is not valid. Researchers need both new theory and computational procedures to be developed to understand nanoscale heat transfer.

Simple QED is a method [4] of nanoscale heat transfer analysis based on QM by the Planck law that conserves heat with EM radiation instead of temperature. Here, QED stands for quantum electrodynamics, a complex theory based on *virtual* photons advanced by Feynman [17] and others. In contrast, simple QED is a far simpler theory based on the Planck law that only requires the heat capacity of the atoms in nanostructures to vanish allowing conservation to proceed by the creation of *real* photons comprising EM waves that stand within and across the nanostructure.

Similar to electron level quantum states, simple QED quantum states are size dependent based on the dimension of the nanostructure over which the EM waves stand. But brief EM confinement of absorbed heat Q at the surface is necessary to form EM waves standing across and within the nanostructure. Earlier EM confinement [4] assumed the inwardly disposed heat Q over the surface was absorbed in a penetration depth δ before forming the standing wave. In this paper, the momentum of the inward heat Q flux as a Poynting vector is proposed to provide a simpler, yet brief EM confinement that forms the standing wave across the diameter d of a NP as shown in Fig. 3.

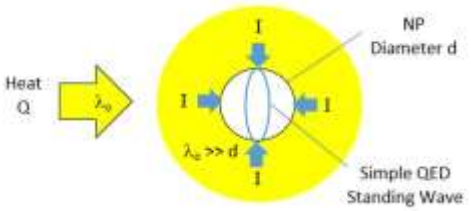

Figure 3. Brief momentum EM confinement

Importantly, the inward disposed Poynting vector is a consequence of the NP be immersed in the EM radiation of heat Q usually in as FIR radiation having wavelength λ_o, where $\lambda_o >> d$ as illustrated with heat Q (yellow) immersing the NP shown in Fig. 3. Since heat Q cannot be conserved by a change in temperature, conservation proceeds by the creation of simple QED radiation in the form of non-thermal standing waves within the geometry of the NP.

The spherically symmetric inward momentum flux I of the incident heat Q acts as the Poynting vector $S = Q/c$ giving $I = \pi d^2 S\Delta t = \pi d^2 Q\Delta t/c$, where Δt is the duration of Q. But the momentum flux p of N_p photons standing in the NP is, $p = N_p \cdot h/\lambda$, where λ is the wavelength of simple QED radiation. For $Np \cdot E = \pi d^2 Q\Delta t$, $I = N_p \cdot E/c = N_p \cdot h/\lambda$. Hence, brief EM confinement requires $I > p$, but thereafter Q vanishes and $p > I$ allowing the standing EM radiation to be emitted to the surrounding. Earlier EM confinement [7] depending on the penetration depth δ produced by pressure of the inward momentum is avoided by using the Poynting vector.

The Planck energy E of a photon in the NP is given by the time τ required for light to travel across and back the NP diameter, $\tau = 2d/(c/n)$, where n is the index of refraction of the NP. Hence, the Planck energy E of the simple QED photons is, $E \sim h/\tau = hc/2nd$ giving the wavelength $\lambda = 2nd$. The simple QED Planck energy E is quantized by the dimension d of the NP that defines the half-wavelength $d = \lambda/2$.

In a rectangular NP with different dimensions of width, thickness, and length there are 3 simple QED quantum states corresponding to the different dimensions of the NP. However, only the minimum dimension is important as by Fermat's principle, the absorbed heat is dissipated in minimum time.

IV. APPLICATION

The application is a NP in a thermal bath. Classically, all atoms in the NP at equilibrium have temperature T equal to the bath temperature. In terms of the Boltzmann constant k and the number N of atoms, the total NP thermal energy U is,

$$U=3/2\ NkT$$

However, by the Planck law the N atoms do not have kT energy. Instead, simple QED conserves the energy U that otherwise would occupy the ~80 nm NP by creating standing EM radiation across the NP diameter d as shown in Fig. 4. t is the duration

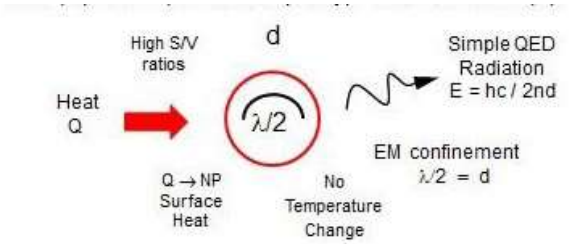

Figure. 4: Planck Energy of EM Radiation

The molecular weight of the lipid meibomian C44H56O2 is 616 and the number N of atoms is, $N = (\rho V/616)\cdot Av$, where volume $V = \rho d^3/6 = 2.68\text{x}10^{-22}$ m^3, density $\rho \sim 1000$ kg/m^3 and Av = Avagadro's. number. Hence, $N = 2.62\text{x}10^5$. Provided momentum flux $I > p$, U = 10.8 keV. For $E = hc/\lambda$ at $\lambda = 254$ nm, $E \sim 4.88$ eV, the lipid NP creates about ~ 2200 UVC photons upon equilibrating with the 300 K body temperature.

Once created, the emitted UVC photons are h/absorbed by the Covid-19 virus or water bath, the bath temperature T once again produces the number of ~ 2200 UVC photons repetitively. Of importance, the UVC photons based on the Planck of QM are created at body temperature. In contrast, UVC photons by classical physics requires temperature $T = E/1.5k \sim$ 37,000 K which is not possible. Need QM to validate the notion of creating UVC photons at ambient temperature.

V. CONCLUSIONS

In simple QED, the Planck law allows ~80 nm lipid NPs to produce UVC radiation that disinfects the Covid-19 from heat at body temperature, a significant difference with classical physics that predicts the lipid NP only acquires the temperature of the bath.

With regard to Covid-19 disinfection treatments, simple QED produces UVC from ~ 80 nm lipid NPs using only the thermal energy of the surrounding blood and tissue.

In the manner of an *in vivo* Covid-19 vaccine, the UVC treatment need only inactivate a few live viruses that then act as the antigen to elicit immunity from the remaining and future Covod-19 virus in the patient.

The CDC is requested to conduct UVC Treatment tests on lipid NPs program to show:

- Lipid NPs > 100 nm produce IR but cannot inactivate live virus to produce antigens.

- UVC is required to produce antigens that requires 70 < NPs < 100 nm.

- EUV from NPs < 70 nm also inactivates live virus, but causes greater DNA damage than at UVC levels → UVC Treatment use 70–100 nm NPs.

In the blood stream, the UVC inactivation would be rapid with the NPs upon entering the brain damage the DNA of neurons. However, our DNA repair systems that evolved necessitated by survival during the UVC intense early Earth damage are expected to readily correct any DNA damage. Indeed, CDC testing to determine acceptable NP dose levels is mandatory to ensure the safety of the UVC treatment of Covid-19.

The mRNA molecule fragility thought resolved by dispersion in lipid NPs leads to other problems not anticipated by Pfizer/Biotech and Modern as the UVC produced by the 80 nm NPs inactivate the mRNA upon dispersion in the NPs.

Since influenza vaccines based on inactivated virus have only 50% efficacy, and since Modern's Covid-19 mRNA vaccine is the genetic equivalent [4] of an inactivated Covid-19 spike, the efficacy of the Covid-19 mRNA vaccine should be near 50% - not over 90%. What this means is the 80 nm NPs carrying the mRNA are the source of the significant increase in efficacy.

The concept of mRNA vaccines requires the mRNA molecules be carried in > 100 nm lipid NPs as the IR radiation created does not inactivate the carried mRNA, but then the Covid-19 efficacy will not be > 90%, rather near 50%.

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