Swine Influenza *in vivo* Vaccine by Nanoparticle Treatment

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Abstract
Classical physics allows the atom to have heat capacity at the nanoscale, the conservation of heat proceeding by a change in temperature. However, simple QED based on the Planck law of quantum mechanics denies the atom in nanostructures the heat capacity to conserve heat by a change in temperature, the consequence of which is any heat is conserved by creating standing EM radiation that is released to the surroundings. Unlike electronic quantum states, simple QED is based on size dependent quantum states depending on the dimensions of the nanostructure over which the EM waves stand. UV radiation is known to disinfect virus in the air or on surrounding surfaces, but not inside body organs. In this regard, patients diagnosed positive for Swine virus are proposed disinfected by a nanoparticle (NP) treatment comprising injections of ~ 80 nm lipid nanoparticles (NPs) in saline, the NPs emitting simple QED induced UV radiation to disinfect the Swine virus powered only by body heat. However, the UV also damages DNA, but at low UV levels, the DNA damage is corrected by repair systems to justify NP Treatment, especially in life-threating situations.

Keywords: Coronavirus, Swine Flu, Planck law, Lipids, Nanoparticles.

I. INTRODUCTION

Since April 2020, the Coronavirus pandemic captivated scientific research. But only a few months later, an influenza virus also having the potential to become a pandemic was reported [1] in China. The new virus carried by pigs the 'swine flu' called G4 EA H1N1 can mutate and spread easily in humans to trigger a global outbreak, just as the world attempts to bring to an end the current coronavirus pandemic.

The new 'swine flu' is similar to the 2009 'swine flu' called A/H1N1pdm09, but differs that like the Coronavirus attacks the cells that line the human airways of the lung. Current flu vaccines do not appear to protect against the new 'swine flu' and a new vaccine will require development and testing.

Similar to Coronavirus, the CDC approach to the Swine virus is likely people lockdown to avoid spreading until an available vaccine is developed, but if not near term is unacceptable because of potential world economic collapse. What this means is the CDC paradigm of vaccine development in response to a 'swine flu' pandemic requires a paradigm shift to a prompt *in vivo* vaccine as proposed in the NP Treatment [2-4] for the Coronavirus.

The NP Treatment differs from the traditional vaccine based on inactivated viruses manufactured in a laboratory by exposing live viruses to UV radiation from lamps, in that the inactivated virus is produced *in vivo* from live virus in the infected patient. Only patients tested positive to have live virus are therefore vaccinated. The vaccination consists of IV injections of NPs in saline into the blood stream, the NPs emitting UV radiation from the heat of surrounding tissue. In effect, the UV radiation kills the live virus in the infected patient to create the inactivated virus that acts as the antigen to elicit immunity.

Unlike the traditional vaccination given as a preventive to non-infected patients, the *in vivo* vaccination is limited to patients tested positive. Indeed, in vivo vaccination may be the only realistic approach to a pandemic as it is impossible for traditional vaccines to be quickly manufactured and made available for the entire world population. Given flu viruses are constantly mutating, the vaccine development time to keep up with the changing virus precludes the paradigm of traditional vaccines in controlling infectious viruses. A paradigm shift to the *in vivo* vaccine in the NP Treatment is suggested.

II. PURPOSE

The purpose of this paper is to present the simple QED treatment of the Swine virus by UV radiation emitted from ~ 80 nm NPs. The NPs in saline solution are administered by IV injections. The UVC radiation emitted from NPs disinfects the 'Swine flu' H1N1 virions as illustrated in Fig. 1.

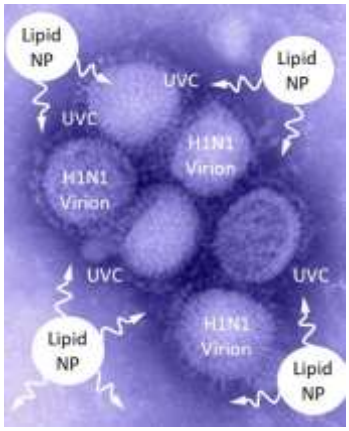

Figure 1. UVC disinfection of Swine H1N1 virus by NPs

III. SIMPLE QED

Simple QED is a nanoscale heat transfer process based on the Planck law [5] of quantum mechanics (QM) differing significantly from that of classical physics. Simple QED applied [2-4] to the Coronavirus showed 80 nm lipid NPs emitted UVC radiation to disinfect Covid-19 from patients already tested positive for the virus. Disinfection of the 'Swine Flu' follows that of the Coronavirus.

Regardless of the virion, simple QED is a method of nanoscale heat transfer analysis that conserves heat with EM radiation instead of temperature. QED stands for quantum electrodynamics, a complex theory based on *virtual* photons advanced by Feynman [6] and others. In contrast, simple QED is a far simpler theory based on the Planck law that 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.

By classical physics, the kT heat capacity of the atom is independent of the EM confinement wavelength λ, where k is the Boltzmann constant and T absolute temperature. QM differs as the heat capacity of the atom decreases under EM confinement λ < 100 microns, and at the nanoscale for λ < 100 nm, the heat capacity may be said to vanish. The Planck law at 300 K is illustrated in Fig. 2.

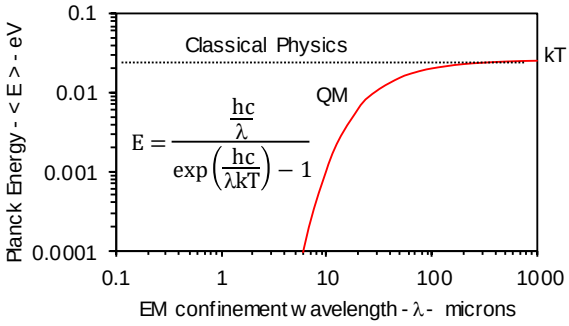

Figure. 2: Planck law of the Atom at 300 °K
In the inset, E is Planck energy, h Planck's constant, c light speed,
k Boltzmann's constant, T temperature, and λ the EM confinement wavelength

EM confinement occurs by the high surface-to-volume (S/V) ratio of nanostructures that requires the heat Q to almost totally be confined in the surface, the surface heat itself as EM energy providing the brief EM confinement necessary to create EM waves standing across the internal dimension d of the nanostructure. More specifically, heat (or light) having wavelength $\lambda >> d$, the light - yellow- immerses the NP and is absorbed in penetration depth δ over the full NP surface as shown in Fig. 3.

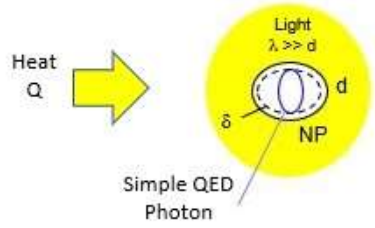

Figure 3. Heat Q (or light) absorbed in NP surface

Confinement of the light Q while creating the UVC standing wave requires EM confinement at least equal to the Planck energy E of the light. The pressure P acting on the surface is given for bulk modulus B and volume strain $\Delta V/V$ by, $P = B \cdot \Delta V/V = 6 \cdot \delta \cdot B/d$. But $P = E / V = 6E/\pi d^3$ giving $\delta = Q/\pi B d^2$. Human meibomian lipids [7] at 300 nm have refractive index n ~ 1.55. For 80 nm NPs, the simple QED energy E and wavelength λ of 5 eV and 248 nm, respectively. Taking a lipid bulk modulus $B \sim 2 \times 10^9$ N/m^2, the absorption depth δ of a single UVC photon is $\delta \sim 20$ fm, a small but necessary depth necessary to confine the absorbed heat Q to the geometry of the standing wave.

Simple QED absorbs heat Q in the NP surface given by the penetration δ depth. Unable to conserve the surface heat by a change in temperature, conservation requires the creation of standing EM radiation, with a creation time $\tau = 2d/(c/n)$. The Planck energy $E \sim h/\tau = hc/2nd$ depends on the refractive index n of the NP to correct for the velocity c of light within the NP. The simple QED Planck energy E is quantized by the dimension d of the NP that defines the half-wavelength $\lambda/2$ of the nanostructure. Fig. 4 illustrates the standing EM radiation in a spherical NP of diameter d, but NP atoms still follow their quantized electron energy levels.

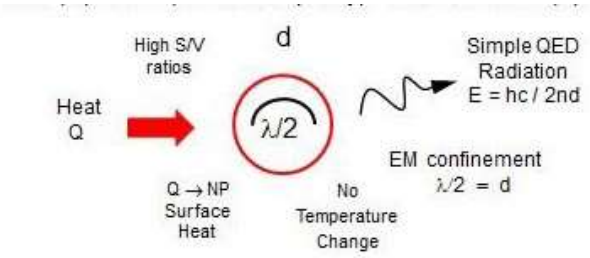

Figure. 4: Planck Energy of EM Radiation

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. Continuous variation in internal nanostructure dimensions produces a broadband spectrum of simple QED dissipated in continuous QED quantum states. Historically, the notion of size dependent quantum states is not found in the literature.

IV. UVC PHOTONS AT AMBIENT TEMPERATURE

The simple QED analysis of the thermal response of a single lipid NP in a thermal bath of tissue and blood is illustrated in Fig. 5.

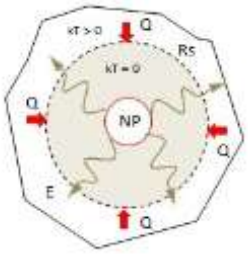

Figure. 5: Lipid NP in a Thermal Bath

The NP absorbs heat Q from the thermal bath at absolute temperature T by conduction. Fig 2 shows Fourier's heat conduction equation at 300 K is only valid in the bath for kT = 0.0254 eV. The radius Rs at which bath atoms have thermal E = kT energy is $\lambda > 200$ microns. For body tissue and water having refractive index n = 1.4, the radius $Rs = \lambda/4n \sim 36$ μm. What this means is the heat flow Q from the bath at temperature T is converted at Rs to EM radiation in the far IR ($\lambda = 4nRs$) and upon being absorbed at by the NP is conserved by emitting simple QED radiation. Small temperature changes occur for $\lambda < 200$ microns, but clearly vanish for NPs < 100 nm.

Classically, all atoms in the lipid 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,

$$U = \frac{3}{2}kNT$$

However, by the Planck law the N atoms do not have E = 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 Figs. 3 and 4. The molecular weight of the lipid meibomian C44H86O2 is 616 and the number Nm of molecules is, $Nm = (\rho V/616)\cdot Av$, where volume $V = \pi d^3/6 = 2.68 \times 10^{-22}$ m^3, density $\rho = 1000$ kg/m^3 and Avagadro's number $Av = 6.023 \times 10^{26}$ mols/kg-mol. Hence, $Nm = 2.62 \times 10^5$ and N = 132 Nm = 34.6 million atoms giving U ~ 1.3 MeV. For UV at 5 eV, the lipid NP creates about 275,000 UVC photons upon equilibrating with the 300 °K thermal bath temperature.

Once created, the emitted UVC photons are absorbed by the bath and the temperature T recovers to once again produce 275,000 UVC photons repetitively. But how rapidly does the NP surface temperature in the bath recover?

The simple QED creation of UVC having Planck energy E = 5 eV at wavelength $\lambda = 248$ nm absorbing a pulse of heat from the water changing the temperature ΔT given [8] by,

$$\Delta T = \frac{1.2}{\pi d^2 K}\left(\frac{E}{\Delta t}\right)\sqrt{\frac{\alpha}{\pi}}\left[\sqrt{t+\Delta t} - \sqrt{t}\right]$$

The Planck energy E = 4.88 eV is spread over the spherical surface area πRs^2. In the 80 nm meibomian NP, the pulse duration Δt is $\Delta t = 2d / (c/n) \sim 0.83$ fs. The UVC heat $Q = E/\Delta t \sim 900$ μW. For the NP in water, thermal diffusivity $\alpha = K/\rho C$, where $\alpha = 1.24 \times 10^{-7}$ m^2/s and K = 0.52 W/m-K. Fig. 6 shows the initial drop in temperature ΔT to be an imperceptible ~ 2 μ°C that recovers in < 1 ps.

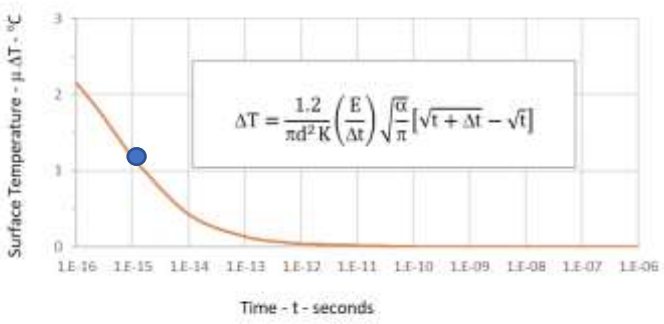

Figure. 6: Single Photon Creation Time

However, the UVC photon must be created promptly, say < 5 fs as noted by the blue circle. What this means is the UVC photon cannot be created from body temperature surroundings. Much higher bath temperatures are required. To create the UVC photon, T = E/1.5k ~ 37,000 °K. But high temperatures are not necessary under high EM confinement.

Once the incident heat Q is absorbed in the penetration depth δ = 20 fm of the NP, the creation time τ of the UVC photon $\tau = 2d/(c/n) \sim 0.83$ fs < 5 fs < 5 fs and acceptable. Indeed, the NPs continually produce UVC photons in human tissue at body temperature.

V. SWINE FLU - H1N1 APPLICATION

The H1N1 2009 virus is morphologically similar [9] to the Coronavirus and influenza A viruses. H1N1 virions are mostly spherical having an average 100 nm diameter containing ~ 10 nm spike glycoproteins as shown in Fig. 6A. However, cylindrical H1N1 virions are found outside the cells averaging 86 nm in diameter and 100 to 300 nm long illustrated in Fig. 6B. Scale bars 100 nm.

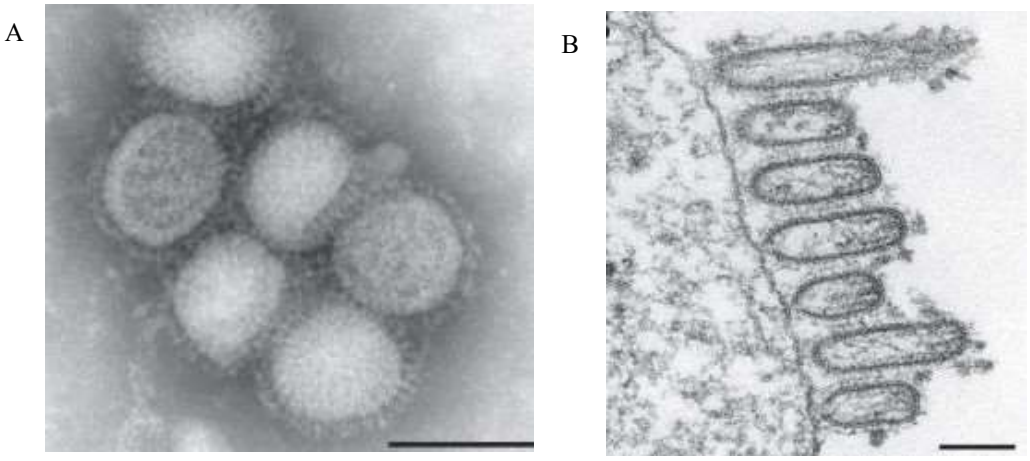

Figure 6.
Swine Flu H1N1virions

Unlike Coronavirus having spherical shapes, the swine flu H1N1 [10] have diameters 80 ~ 120 nm with spherical, horseshoe, and filamentous shapes. In simple QED, the diverse filamentous shapes at an average 100 nm diameter are not of significance in that the EM waves stands across the diameter even if the interior is empty. But the empty virion has a RI lower than that of the solid sphere.

Given the large variation in H1N1 virion features, the shape chosen for analysis has 100 nm diameter. In case of enveloped viruses, the lipid bilayer [11] has a RI of n = 1.48–1.49. The simple QED radiation induced in the Swine Flu body and spikes including lipid NPs treatment UVC disinfection are summarized in Table 1.

Table 1
Swine Flu (H1N1): Simple QED Energy and Wavelengths

Parameter	H1N1 Body	H1N1 Spike	Nanoparticle
Material	Lipid	Lipid	Meibomian
Diameter d (nm)	100	10	80
Refractive Index n	1.48	1.48	1.55
Wavelength λ (nm)	296	30	248
Planck energy E (eV)	4.20	42	5

Recall EUV (< 200 nm), UVC (200 to 280 nm), UVB (280 to 320 nm), and UVA (320 to 400 nm). The Swine flu virion body emission (296 nm at short wavelength UVB) and spikes (30 nm in the EUV) while the NP emits (~248 nm near the 254 nm UVC peak). It is noted the Swine flu body emission increases toward the UVC peak for NP diameters < 80 nm. For comparison, the Coronavirus summary [2] is shown below in Table 2.

Table 2
Coronavirus: Simple QED Energy and Wavelengths

Parameter	Coronavirus Body	Coronavirus Spike	Nanoparticle
Material	Lipid	Lipid	Meibomian
Diameter d (nm)	100	15	80
Refractive Index n	1.6	1.6	1.55
Wavelength λ (nm)	320	48	248
Planck energy E (eV)	3.88	26	5

VI. DISCUSSION

In simple QED, the Planck law allows the NPs to produce EM radiation to disinfect the Swine flu H1N1 virus from the heat at body temperature, a significant difference with classical physics that predicts the NPs only acquire the temperature of the bath.

The NP Treatment in Swine flu H1N1 based on simple QED induced UV radiation is easily an easily implemented solution. Considerable data exists to support the argument that NPs kill organisms and damage the DNA. However, only simple QED argues the NPs depending on size create UV radiation in equilibrating the thermal energy of the surrounding blood and tissue. In NPs, UVC photons are produced at body temperature.

In the NP Treatment is a vaccine because the antigen is the inactivated virus created from *in vivo* killing of the real virus in a Swine flu infected patient with the UVC emitted from the lipid NPs. By contrast, traditional vaccinations use antigens of the real virus inactivated in a laboratory by standard UV lamps, the inactivated virus included in the vaccine before injection in the patient.

The dose of NPs in saline solution can only be determined by CDC and FDA controlled testing with emphasis placed on neuron and DNA damage. The lowest NP concentration that disinfects the Swine flu H1N1 virus is the goal as DNA damage from low intensity UV can be corrected by DNA repair systems. For Swine flu patients in a life-threatening condition, DNA damage appears justified.

The NP Treatment of Swine flu H1N1 assumes IV injection of NPs in saline. But the non-invasive pulmonary route [12] also reaches the lungs, and as such is an attractive alternative. Nebulizers currently appear to be the most appropriate devices for the safe delivery of large amounts of NPs without the need pf professional medical personnel and are recommended for development in administering the UV disinfection of any and all virus.

The CDC vaccine paradigm in controlling infectious disease appears to no longer applicable be as the viruses simply mutate. Only the NP treatment of patients having the actual virus is relevant, of which the NP Treatment creates a few antigens upon UVC killing of a limited number of real viruses by 80 nm lipid NPs, the immune system inactivating the remaining real virus virions. The UVC not only disinfects the virus at hand, but any mutations thereof. Indeed, the NP treatment may in fact be the long sought Universal vaccine.

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