The CoVid-19 *in vivo* Nanoparticle Vaccine

Thomas Prevenslik
Berlin 10777 Germany

Abstract
Vaccine development in preventing CoVid-19 requires long development and testing time which is unacceptable to attendant social unrest and world economic collapse. Instead of preventative vaccines, a CoVid-19 treatment of patients already tested positive is proposed using intravenous injections of lipid nanoparticles (NPs). The NP treatment includes only biodegradable lipid NPs in saline. In contrast, preventive vaccines include the inactivated virus, aluminum adjuvants, formaldehyde, antibiotics, and stabilizers, but in the bloodstream of the CoVid-19 patient none of the preventive vaccine ingredients are likely found. Indeed, only the live virus exists. UV light can inactivate the live virus, but no UV sources are known within the human body. In this regard, simple QED theory based on the Planck law denies atoms in NPs the heat capacity to conserve heat by an increase in temperature. Instead, NPs convert heat from the blood into EM radiation at a wavelength depending on the NP size. e.g., ~ 80 nm lipid NPs emit UVC (254 nm) radiation. In the manner of an *in vivo* vaccine, the UVC kills the live virus to produce the inactivated virus that acts as the antigen in providing immunity to prevent subsequent infection. What this means is the NPs not only disinfect the patient of CoVid-19, but also provide immunity. By controlling the NP dose, the UVC is held to low levels of collateral DNA damage allowing recovery by DNA repair systems.

Keywords: CovVid-19, vaccine, antigen, UV, Nanoscale heat transfer.

I. INTRODUCTION

Vaccines to prevent viral infection generally include the inactivated virus, aluminum adjuvants to enhance the immune system response, formaldehyde to assure inactivation is complete, antibiotics to prevent contamination during manufacturing, and stabilizers during storage. CoVid-19 vaccine [1] comprises live, inactivated, and DNA or mRNA antigens. Live vaccines are based on genetic engineering having a surface protein of CoVid-19 to trigger an immune response. Inactivated vaccines use killed CoVod-19 viruses, but are recognized by the body as foreign and produces antibodies. Gene-based vaccines are the preferred approach comprising pure genetic information in the form of DNA or mRNA of the virus processed into carrier nanoparticles (NPs) that enter cells and form harmless virus proteins to provide immunity. Compared to live and inactivated vaccines, gene-based vaccines allow quick vaccine production which is of importance in CoVid-19 because billions of doses need to be available to most of the people of the world.

However, the history of vaccinations did not originate with gene-based vaccinations. Over 150 years ago, Pasteur envisioned [2] that live or inactivated microbial pathogens could be used to protect against the pathogen itself. Today, the inactive virus is preferred [3] over live virus, but is problematic because inactivation may turn out to be incomplete leading to outbreaks after vaccination. Formaldehyde and UV radiation are generally used to completely inactivate the virus. Formaldehyde alters virus structure while UV mainly influences the virus genome and preserves structure. In CoVid-19 vaccines, the chemical inactivation of a virus is complex compared to the far simpler inactivation by UV radiation which is pursued here.

Indeed, UV inactivation in CoVid-19 vaccine development is supported by a history of UV disinfection [4] of viruses in the air or on solid surfaces, the UV supplied by external lamps. For viruses having size of about 100 mm, disinfection requires germicidal UVC (254 nm) radiation and has been used [5] to disinfect localized infections suggesting UVC is suitable in inactivated CoVid-19 vaccines as well as providing antigenicity.

The problem is the CoVid-19 is not found near or on exterior body surfaces, but rather in the lungs not accessible to external UVC lamps. Recently, UVA light was made available [6] inside the lungs by a device 'Healight' comprising a flexible catheter equipped with LEDs. But CoVid-19 is not present only in the lung, and rather spread throughout the body and even the brain, all of which cannot be accessed with UVA from the lung.

An *in vivo* UVC light source having access throughout the body is required,
but is not known to exist.

In this regard, UVC disinfection of CoVid-19 having access throughout the body comprising lipid NPs injected in the bloodstream was proposed [7] to convert heat in the blood to size dependent wavelengths of EM radiation. The conversion is a natural consequence of the Planck law that denies NPs the heat capacity to conserve heat by an increase in temperature. Instead, the NP conserves heat by emitting EM radiation at wavelengths depending on the dimensions of nanoscopic NP features. By the theory of simple QED, UVC disinfection requires solid lipid NPs having diameters ~ 80 nm. The CoVid-19 also emits EM radiation as the average diameters of the body (~ 100 nm) emit UVB with the spikes (~15 nm) emitting EUV as illustrated in Fig. 1.

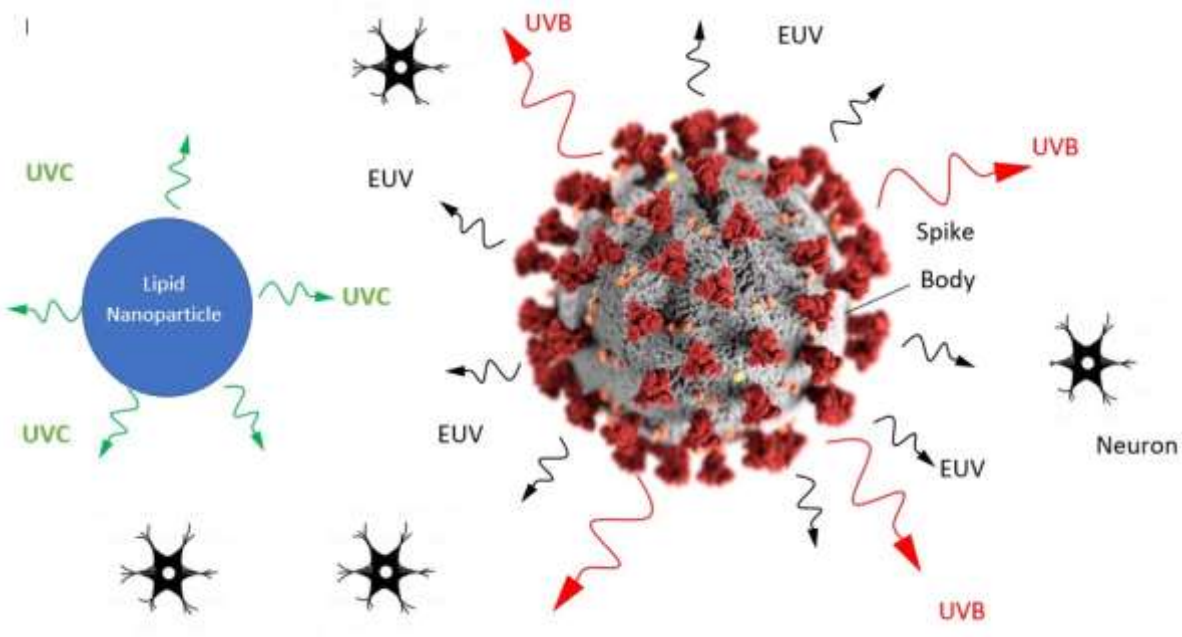

Figure 1. UVC disinfection of CoVid-19 by NPs.

In the UVC disinfection of CoVid-19 by NPs, it is of interest to consider how NPs can be used in vaccinations to protect against CoVid-19 or any other virus. For vaccines to prevent a virus infection, UV inactivated fragments of the virus from external sources would be included with the lipid carrier during NP fabrication. Even so, the vaccine would require massive amounts of UV inactivated fragments for the world population.

A more practical solution is to only treat patients already infected with the virus with UVC disinfection by NPs alone, the UVC not only inactivating the virus, but also producing *in vivo* the inactivated virus for vaccinations. Recalling Pasteur's thought that inactivated microbial pathogens could be used to protect against the pathogen itself, vaccination against the virus only requires the presence of the virus during UVC disinfection. Since UV-inactivated viruses

are able to induce an immune response, the proposed *in vivo* UVC inactivation should produce immunity. To be sure, virus vaccination by NPs is not a vaccine, but rather a treatment after the patient is infected. Nevertheless, NP treatment offers the patient a virus disinfection that may be not only life-saving, but also providing immunity against subsequent virus infections.

II. PURPOSE

To support simple QED induced EM radiation from intravenous injections of doses of lipid NPs in saline as a rational basis for the *in vivo* CoVid-19 vaccine that also disinfects by UVC radiation from NPs. How UVC disinfection of CoVid-19 elicits immunity is discussed.

III. BACKGROUND

Over a century ago, investigations of UV radiation discovered using avirulent antigens of a virus for vaccination, but development of the technology for complete inactivation was not available. Today, UV lamps and LEDs have improved inactivation of virus in the air or on external surfaces, but are not applicable within the human body. However, simple QED proposes NPs distributed throughout the bloodstream emit UV radiation allowing vaccine development to proceed based on *in vivo* local inactivation of viruses. Surely, if Pasteur were aware of NPs emitting UV, NP vaccines would have been developed by the UV inactivation of virus particles in an infected patient, each particle acting as an antigen in the immune response against subsequent virus infection.

Absent NPs, UV inactivated SARS-CoV virus particles [8] subcutaneously injected in mice with and without an adjuvant elicited a high level of humoral immunity, resulting in the generation of long-term antibody secreting and memory B cells. UV inactivation of the SARS virus particles was performed under 365 nm UVB lamps *ex vivo* the patient. Indeed, the vaccine containing UV inactivated SARS-CoV particles was able to induce long-term antibody production even without an adjuvant. What this means is whole killed SARS-CoV particles can serve as a candidate [9] antigen for the SARS vaccine eliciting both humoral and cellular immunity.

But can NPs inactivate virus and still elicit immunity?

Recently, the importance of NPs in adjuvants [10] of vaccines was reviewed. Since the 1920's, adjuvants of aluminum salts (alum) have been traditionally thought to stimulate immune response of vaccine antigens, although the mechanism is not known by which alum adjuvants augment immunity, particularly T-cell responses. However, since alum adjuvants are ~ 0.5 – 10 micron microparticles, each of which are aggregates of ~ 100 nm alum NPs, and since NPs alone were found [10] to significantly enhance immune response of traditional alum adjuvants, it can be concluded that over the past 100 years, NPs were present in the alum adjuvants as confirmed in Fig. 2 showing NPs everywhere in a TEM micrograph over a ~ 0.5 micron area of alum adjuvant. NPs alone are present around ~100 nm while alum adjuvant aggregation is centered at ~ 5 microns. But notice the alum adjuvant includes a NP content as otherwise alum adjuvants would not have stimulated vaccines. By simple QED, the NPs emitting UV radiation to elicit immunity by stimulating T-cells.

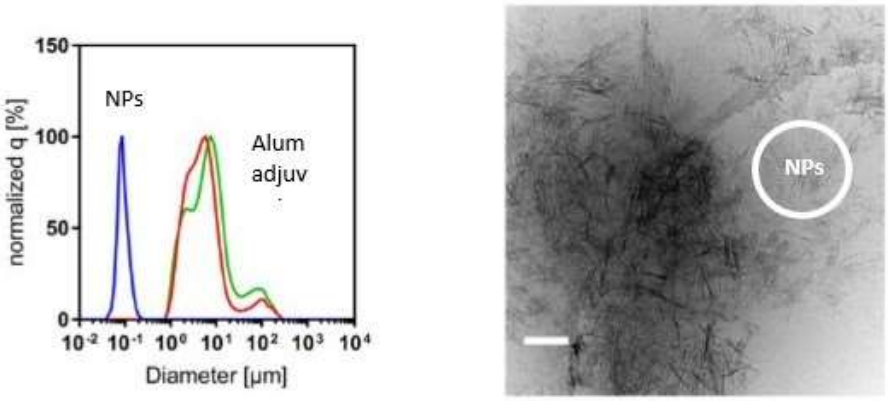

Figure 2. NPs in Alum Adjuvants

. What this means is simple QED induced UV from NPs in saline administered by intravenous injection to infected CoVid-19 patients not only disinfects the virus, but also provides immunity to prevent subsequent CoVid-19 infections. Unlike traditional vaccines, the NP vaccine does not contain any drugs - only NPs.

Other than CoVid-19, simple QED was used to support both the advantage and disadvantage of NP induced DNA damage. For CoVid-19, NPs emitting UV offer desirable disinfection and immunity, but NPs can be a disadvantage as UV induces unwanted DNA damage. Indeed, UV radiation of neurons can cause [11] DNA damage leading to neuro-degenerative diseases from aluminum adjuvants in vaccines and even genetically modified food. At the same time, nanoscale ~ 100 nm films on drinking bowls offer a means to disinfect drinking water from body heat in the hands. Simple QED induced UV explains both advantages and disadvantages of NPs.

IV. SIMPLE QED.

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 [12] 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. 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 [13] and others. In contrast, simple QED is a far simpler theory based on the Planck law of quantum mechanics (QM) 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. The standing waves of interest are in the UVC that by classical physics require extreme temperatures of ~37,000 K for creation.

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 < 200 microns. At the nanoscale λ < 100 nm, the heat capacity vanishes. The Planck law at 300 K is shown in Fig. 3.

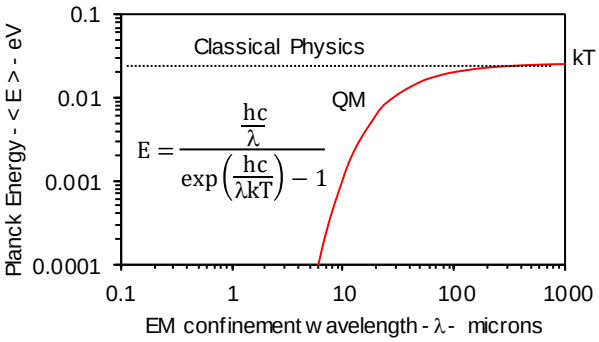

Figure. 3. Planck law of the Atom at 300 °K
In the inset, E is Planck energy, h Planck's constant, c light speed, k Boltzmann's constant, T temperature, and λ the EM confinement wavelength

Classically, the UVC photon can only be created at very high temperatures T, i.e., T = E/1.5k ~ 37,000 K. But high temperatures are not necessary under high EM confinement provided by the absorbed heat Q from the surroundings. EM confinement requires the heat Q to almost totally be confined to the nanostructure surface. For the NP, the surface heat itself absorbed in the penetration depth δ provides the brief EM confinement necessary to create EM waves standing across the diameter d as shown in Fig. 4. Heat (or light) having wavelength λ >> d, the light (yellow) immerses the NP and is absorbed over the full NP surface.

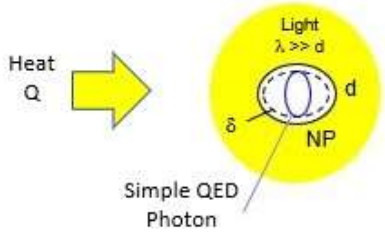

Figure 4. Heat Q (or light) absorbed in NP surface

Confinement of the light Q while creating the standing wave requires EM confinement at least equal to the Planck energy E of the absorbed light. The pressure P acting on the surface is given for bulk modulus B and volume strain ΔV/V by, $P = B \cdot \Delta V/V = 6 \cdot \delta \cdot B/d$. But $P = E / V = 6E/\pi d^3$ giving $\delta = Q/\pi B d^2$. Consider human meibomian lipids [14] at 250 nm having refractive index n ~ 1.55 (extrapolated). For 80 nm lipid NPs, the simple QED wavelength λ ~ 248 nm and E ~ 4.88 eV. Taking a lipid bulk modulus B ~ 2×10^9 N/m^2, the absorption depth δ of a single UVC photon is δ ~ 20 fm - a small but necessary depth to confine the absorbed heat Q = E to the geometry of the standing wave.

Once the heat Q is absorbed in the penetration depth δ = 20 fm of the NP, the time τ to create the UVC photon as the EM heat Q travels to the NP center is, τ = 2d/(c/n) ~ 0.83 fs and prompt. What this means is the 80 nm NPs under EM confinement are continually producing UVC photons in human tissue at body temperature.

Classically, the number N of atoms created in the NP at equilibrium have temperature T equal to body temperature. The total NP thermal energy is, U = 1.5 N kT. 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 Fig. 4. The molecular weight of the meibomian C44H56O2 is 565 and the number N of atoms is, $N = (\rho V/565)\cdot Av$, where volume $V = \pi d^3/6 = 2.68x10^{-22}$ m^3, density $\rho = 1000$ kg/m^3 and Avagadro number $Av = 6.023 \times 10^{26}$ mols/kg-mol. Hence, $N = 2.85x10^5$ and U ~ 10.8 keV. For $E = hc/\lambda$ at $\lambda = 248$ nm, E ~ 5 eV and the NP creates about 2200 UVC photons upon equilibrating with the 300 °K surroundings.

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. 5 illustrates the standing EM radiation in a spherical NP of diameter d, but NP atoms still follow their quantized electron energy levels.

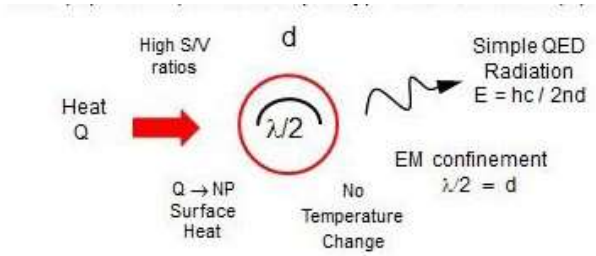

Figure. 5. Planck Energy of EM Radiation

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

V. APPLICATION

The simple QED radiations associated with the proposed CoVid-19 treatment include the CoVid-19 body and spikes and the 80 nm lipid NPs. For the CoVid-19, the simple QED Planck energy E and wavelength λ are based on the NP diameter d and refractive index n. The CoVid-19 body diameter d varies from 80 - 120 nm [15] with 100 nm being the average diameter for the coronaviridae family. Similar to SARS, the Covid-19 spikes are globular proteins d ~ 15 nm in diameter [16] attached to the virus body by a narrow stalk. With regard to the index n of the virus, available data is not clear. Even so, the index in the UV or EUV is required, but only data is available in VIS, e.g., n = 1.42 at $\lambda = 830$ nm [14]. Optical fringe measurements [17] show a maximum index n ~ 1.8 with the average of variations across the virus body taken as n ~ 1.6. The index n of the spikes could not be resolved [18] and is also taken at n ~ 1.6. The index n ~ 1.55 of the lipid NP is required at 248 nm corresponding to the Planck energy E of the 80 nm NP was extrapolated from data [14] at 400 nm. The simple QED summary of the CoVid-19 body and spike including the lipid NP is summarized in Table 1.

Table 1
Simple QED Energy and Wavelengths

	Body	Spike	Nanoparticle
Material	CoVid-19	CoVid-19	Lipid
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

Recall EUV (< 200 nm), UVC (200 to 280 nm), UVB (280 to 320 nm), and UVA (320 to 400 nm). The CoVid-19 body emission (320 nm at long wavelength UVB) and spikes (48 nm in the EUV) while the NP emits (~248 nm near the 254 nm UVC peak). It is noted the CoVid-19 body emission increases toward the UVC peak for NP diameters < 80 nm.

VI. TREATMENT

The history of vaccines against infectious viruses suggests a CoVid-19 vaccine developed by traditional searches for antigens will be difficult, if not impossible in the near term. In contrast, CoVid-19 treatments avoiding the serendipity search for antigens are more likely to be developed than vaccines. Indeed, blood plasma is already available, but not actively pursued because the CDC and FDA are subservient to the paradigm of vaccines to disinfect viruses. But vaccines take time for development and testing which is not an option in the current CoVid-19 pandemic. Moreover, a CoVid-19 vaccine even if found will not likely survive mutations and future viruses that will require development of yet another vaccine.

What this means is a paradigm shift from vaccines to treatment of viral infection is unavoidable. Vaccination even if successful would not be practical for the entire world population. Accordingly, CoVid-19 treatment of only the population tested to have the virus emerges as the realistic solution. Indeed, treatment instead of vaccines should be adopted by the CDC and FDA as the new paradigm.

Simple QED proposes UVC disinfection of the CoVid-19 using doses of biodegradable lipid NPs in saline delivered intravenously by injections. The interaction between the NPs and the CoVid-19 is illustrated in Fig. 1 and summarized in Table 1. Of importance is the DNA absorption spectrum [19] shown in Fig. 5.

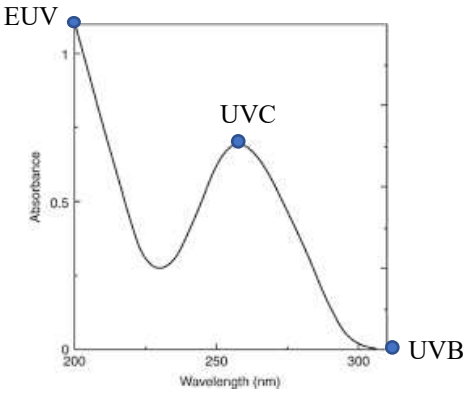

Figure 5. DNA absorption spectrum

The DNA has peaks at 260 nm in the UVC and in the EUV beyond 200 nm. The 100 nm CoVid-19 body emission in the UVB at 320 nm is not absorbed by the DNA and does not cause DNA damage to brain neurons. But DNA damage of neurons may be expected for virus diameters < 80 nm. The UVB at 320 nm finds importance [20] only in initiating the 'cytokine storm' and 'blood clot storm'.

UVC disinfection of the CoVid-19 from the 80 nm NP emission occurring at 248 nm inactivates the virus DNA. The UVC also damages brain neurons, but at low levels the DNA damage is corrected by DNA repair systems. EUV at 48 nm from the spikes does not damage brain neurons and appears to only assist burrowing through cell walls. However, these predictions depend strongly on the refractive indices of the CoVid-19.

VII. CONCLUSIONS

In simple QED, the Planck law allows the lipid NPs to produce EM radiation to disinfect the CoVid-19 virus from heat at body temperature, a significant difference with classical physics that predicts the NPs only acquire body temperature. UVC photon are created in NPs under EM confinement at body temperature and do require ~37,000 K temperatures.

With regard to providing CoVid-19 disinfection treatments, simple QED induced UV radiation from NPs offers an easily implemented solution. Considerable theory exists to support the argument that NPs kill viruses, but a physical mechanism does not exist. However, only simple QED argues the NPs depending on size create UV radiation in equilibrating the thermal energy of the surrounding blood and tissue.

NPs convert heat from the blood into EM radiation at a wavelength depending on the NP size. For ~80 nm lipid NPs, UVC (254 nm) radiation kills the live CoVid-19 virus to create an *in vivo* vaccine comprising the inactivated virus that acts as an antigen in providing immunity to subsequent CoVid-19 infection.

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 CoVid-19 is the goal as collateral DNA damage to adjacent tissue from low intensity UV can be corrected by DNA repair systems. For CoVid-19 patients in a life-threatening condition, DNA damage appears justified.

Over the past century, the mechanism by which adjuvants of aluminum salts are thought to stimulate immune response of vaccine antigens is nothing more than simple QED induced UV radiation from ~100 nm cylindrical particles that aggregate to form the micron size > 500 nm particles actually observed.

The vaccine paradigm as the norm in controlling infectious disease appears to no longer applicable as the CoVid-19 virus will simply mutate or other viruses may appear. Genetic basis to the CoVid-19 excludes the effect of simple QED induced EM radiation. Only a UVC treatment of patients diagnosed as having the CoVid-19 by intravenous injections of 80 nm NPs, or the equal appears relevant as vaccinations for all people in the in the world is unrealistic, if not impossible.

The CoVid-19 *in vivo* vaccine based on intravenous injection of lipid NPs is extended to the preferred oral delivery of NPs in a forthcoming paper.

References

1. DW-News (2020) The race towards a CoVid-19 vaccine: What's the latest? https://www.dw.com/en/the-race-towards-a-CoVid-19-vaccine-whats-the-latest/a-53330975
2. Plotkin SA. (2005) Vaccines: past, present and future. Nature Medicine Supplement 11: S5-S11.
3. Delrue I, et al. (2014) Inactivated virus vaccines from chemistry to prophylaxis: merits, risks and challenges. Expert Review of Vaccines. https://doi.org/10.1586/erv.12.38
4. Downes A, Blunt TP. (1877). Researches on the effect of light upon bacteria and other organisms. Proc R Soc Lond. 26:488-500.
5. Vantasever F, et al. (2013) Can biowarfare agents be defeated with light? Virulence 4:796–825.
6. Hiltzik M. - Los Angeles Times (2020) Column: How Cedars-Sinai got sucked into the battle over Trump's claim of a COVID-19 treatment. May 1. https://www.latimes.com/business/story/2020-05-01/cedars-sinai-trump-covid-cure
7. Prevenslik T. (2020) Coronavirus by UV from Lipid Nanoparticles. https://www.nanoqed.org , 2020.
8. Takusaku N, et al. (2004) A subcutaneously injected UV-inactivated SARS Coronavirus vaccine elicits systemic humoral immunity in mice. International Immunology. 16: 1423–143.
9. Tsunetsugu-Yokota Y et al. (2008) Large-scale preparation of UV-inactivated SARS Coronavirus virions for vaccine antigen. Methods Mol Biol. 454:119-26.
10. Orr MT, et al. (2020) Reprogramming the adjuvant properties of aluminum oxyhydroxide with nanoparticle technology npj Vaccines. https://doi.org/10.1038/s41541-018-0094-0
11. Prevenslik T. Nanoparticles and DNA damage. GM Food: A Crime against Humanity; UVC disinfection of drinking water. https://www.nanoqed.org , 2017 - 2019.
12. Planck M. (1900) On the Theory of the Energy Distribution Law of the Normal Spectrum. Verhandl. Dtsch. 2: 2-37.
13. Feynman R. (1976) QED The Strange Theory of Light and Matter. Princeton University Press
14. Tiffany JM. (1986) Refractive index of meibomian and other lipids. Current Eye Research - Short Communication. 5:887-889
15. Guy JS, et al. (2006) Characterization of a Coronavirus Isolated from a Diarrheic Foal. J. Clinical Microbiology. 38:4523–4526.
16. Beniac ER, et al. (2006) Architecture of the SARS Coronavirus prefusion spike. Nature Structural Molecular Biology 13:571-572.
17. Pang Y, et al. (2016) Using optical trap to measure the refractive index of a single animal virus in culture fluid with Optics and Photonics Journal, 2016, 6, 75-86 high precision. Biomedical Optics Express. 7: 1 672-1689.
18. Hamed AM. (2016) Image Processing of Corona Virus Using Interferometry. Optics and Photonics Journal. 6:75-86.
19. Rodger A. (2013) UV Absorbance Spectroscopy of Biological Macromolecules. In: Roberts G.C.K. (eds) Encyclopedia of Biophysics. Springer, Berlin, Heidelberg.
20. Prevenslik T. (2020) Mystery pulmonary and neurological symptoms by EM radiation from the CoVid-19 https://www.nanoqed.org , 2020.

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