

METHOD

The importance of being aware of the virus and disinfection of all things around and used. Due to that this is a pandemic, and since the work needs to so aware, so the number of samples in the present work is 20. A medical specialist uses a swab to collect respiratory material samples found in patients nose. For each patient, four samples were taken, one to be tested to the assurance of the coronavirus positive test and the others to exposure to plasma source. In clinical lab the commonly used test is the "PCR assay," were done to all samples. PCR test which is a "polymerase chain reaction," is a specific type of nucleic acid test. It examines the amount of coronavirus' genetic material in samples. At medical lab, a long stick was inserted with a very soft brush on the end kind of like a pipe cleaner up nose and around for a few seconds. The PCR test then done at medical specialist lab by using certain chemical solutions or materials and enzymes and a thermal cycler. The thermal cycler increases traces of genetic material in the test tube at each heating and cooling step. After many cycles, millions of copies of a small portion of the virus's genetic material are present in the test tube. By using one of the chemicals in the tube, fluorescent light produced if the virus is present in the sample. Using special software to interpret the signal as a positive test result. The samples in the present study were of patients with positive test for different dates of examinations, sex, and ages. We use two samples for each patient test. The samples exposure time was 1 to 12 step 4 minutes. The cold plasma source was oxygen gas plasma in the laboratory with voltage 5 Kv and the design is the general system design.

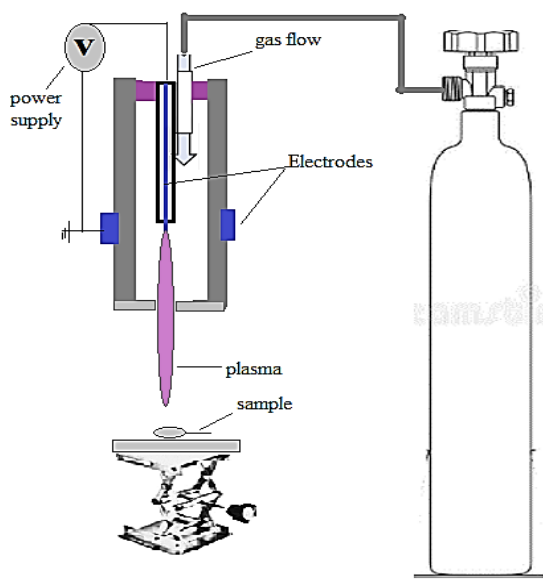


Fig. 1: A simple diagram to the cold atmospheric plasma system used in the work

Cold Atmospheric Plasma Jet

To make the exposure part, an atmospheric plasma jet was used for the process to produce cold plasma with argon gas at a constant voltage. Discharge gas which was Argon gas. The discharge gas is necessary to produce the generate plasma. Hollow tube of stainless steel with internal diameter 2 mm and length 3 cm. A meter connected to the tube which is of gas flow type to monitor the gas intake. Calibrator with flow 5 L/min. a high voltage source also used of D.C. supply of 10 kV voltage with a step frequency equal to 25 kHz. Figure 1 shows the cold plasma jet diagram.

RESULTS AND DISCUSSION

Nowadays, all the world works focus on the way of control on the corona virus pandemic. So researchers make tests and experiments to explain, understand or treatment from it. Table 1 the patient's information and PCR test.

From work and by notice the PCR test obtained, results show that at the beginning of exposure time there is no change in the virus. As the time of exposure was 6 minutes, the nasal

Table 1. The patient's information (sex, age) and the PCR Test before and after exposure to cold plasma

Sl. No.	Sex	Age	PCR before sample exposure to plasma	PCR afier sample exposure to plasma
1	Female	35	+ve	-ve
2	Female	38	+ve	-ve
3	Female	33	+ve	-ve
4	Female	42	+ve	-ve
5	Female	39	+ve	-ve
6	Male	36	+ve	-ve
7	Male	35	+ve	-ve
8	Male	35	+ve	-ve
9	Male	40	+ve	-ve
10	Male	44	+ve	-ve
11	Female	43	+ve	-ve
12	Female	16	+ve	-ve
13	Male	50	+ve	-ve
14	Male	52	+ve	-ve
15	Male	38	+ve	-ve
16	Female	40	+ve	-ve
17	Male	41	+ve	-ve
18	Male	33	+ve	-ve
19	Female	33	+ve	-ve
20	Female	33	+ve	-ve

samples test shows no coronavirus in the PCR test. Which means, the cold atmospheric plasma ended the present of the virus in samples or reduced it to a value as little as that not significant. Increasing the time of exposure didn't change the test since it already (the sample) has no virus detection at time 6 minutes. The effect of cold plasma on the virus comes from the reactive species produced due to discharge of gas. These reactive species attack the virus cell, damage its surface by electrostatic disruption due to electrostatic force [14-15]. The electrostatic force may break open the virus cell membrane when exceeding the tensile strength of it. Increasing the reactive species will increase the effect on the virus activity and decrease the time of treatment. This can be done by increasing the gas discharge intensity. us to conclude that cold atmospheric plasma can be used as an efficient tool for disinfection of places, and things of people who are infected with coronavirus. Our results are in agreement with literatures used cold plasma in treatment with viruses. One note has to be said here is that the patients under our tests were not who under emergency. The work was not easy due to the danger of dealing with samples of coronavirus which is the most virus that attack world and causes millions of deaths in the world.

REFERENCES

1. Study the Effect of Mobile (Cell Phone) on the Heart Electricity, D Hussain, AH Ali, SN Mazhir, A Juma - Int. J. of Appl. Inf. Sys. (IJ AIS), FCS, New York, USA, 2014
2. Measurement Radon Concentration in Imported and Local Wood Using Solid State Nuclear Track Detectors, Dawser Hussain Gh. , Basim Khalaf R. , Zainab Hazim A., Baghdad Science Journal, 2013, Volume 10, Issue 2, Pages 296-300
3. Clinical Plasma Medicine: State and Perspectives of in Vivo Application of Cold Atmospheric Plasma, Th. von Woedtke, H.-R. Metelmann, K.-D. Weltmann, contribution to plasma physics, Volume 54, Issue 2, February 2014, pages 104-117
4. Cold atmospheric plasma in cancer therapy, Physics of Plasmas 20, 057101, (2013); <https://doi.org/10.1063/1.4801516>, Michael Keidar^{1, b)}, Alex Shashurin¹, Olga Volotskova¹, Mary Ann Stepp, Priya Srinivasan, Anthony Sandler, and Barry Trink.
5. G.Daeschleina, S.Scholza†R.Ahmedb†T.von Woedtkech.HaaseaM. NiggemeieraE.KindelcR.BrandenburgcK.-D.WeltmannmM.Juengera Journal of Hospital Infection, Volume 81, Issue 3, July 2012, Pages 177-183
6. Mohades S, Laroussi M, Sears J, Barekzi N, Razavi H. 2015. Evaluation of the effects of a plasma activated medium on cancer cells. Phys Plasmas 22:122001. <https://doi.org/10.1063/1.4933367>.
7. Park DP, Davis K, Gilani S, Alonzo CA, Dobrynin D, Friedman G, Fridman A, Rabinovich A, Fridman G. 2013. Reactive nitrogen species produced in water by non-equilibrium plasma increase plant growth rate and nutritional yield. Curr Appl Phys 13:S19 - S29. <https://doi.org/10.1016/j.cap.2012.12.019>.
8. Alshraiedeh NH, Alkawareek MY, Gorman SP, Graham WG, Gilmore BF. 2013. Atmospheric pressure, nonthermal plasma inactivation of MS2 bacteriophage: effect of oxygen concentration on virucidal activity. J Appl Microbiol 115:1420 - 1426. <https://doi.org/10.1111/jam.12331>.
9. Alekseev O, Donovan K, Limonnik V, Azizkhan-Clifford J. 2014. Nonthermal dielectric barrier discharge (DBD) plasma suppresses herpes simplex virus type 1 (HSV-1) replication in corneal epithelium. Transl Vis Sci Technol 3:2. <https://doi.org/10.1167/tvst.3.2.2>.
10. Zimmermann JL, Dumler K, Shimizu T, Morfill GE, Wolf A, Boxhammer V, Schlegel J, Gansbacher B, Anton M. 2011. Effects of cold atmospheric plasmas on adenoviruses in solution. J Phys D Appl Phys 44:505201. <https://doi.org/10.1088/0022-3727/44/50/505201>.
11. Aboubakr HA, Williams P, Gangal U, Youssef MM, El-Sohaimy SAA, Bruggeman PJ, Goyal SM. 2015. Virucidal effect of cold atmospheric gaseous plasma on feline calicivirus, a surrogate for human norovirus. Appl Environ Microbiol 81:3612-3622. <https://doi.org/10.1128/AEM.00054-15>
12. Journal of Optoelectronic and Biomedical Materials Vol. 13, No. 4, October-December 2021, p. 177-182 Antibacterial activity with eggshell nano-particles activated by microwave plasma A. Q. Muryoush, D. Hussain*, A. H. Ali.
13. Zhitong Chen, Gustavo Garcia, Jr., Vaithilingaraja A. and Richard E. Wirz¹, Cold atmospheric plasma for SARS-CoV-2 inactivation, physics of fluids, 32, 111702 (2020); doi: 10.1063/5.0031332.
14. Z. Chen and R. Wirz, "Cold atmospheric plasma for COVID-19," preprints:202004.0126.v1 (2020).
15. E. Kvam, B. Davis, F. Mondello, and A. L. Garner, "Nonthermal atmospheric plasma rapidly disinfects multidrug-resistant microbes by inducing cell surface damage," Antimicrob. Agents Chemother. 56, 2028 (2012).