UNDERSTANDING COVID VACCINES

New Vaccine, New Hope

Vaccine Types

MRNA VACCINE IN A LIPID PLATFORM

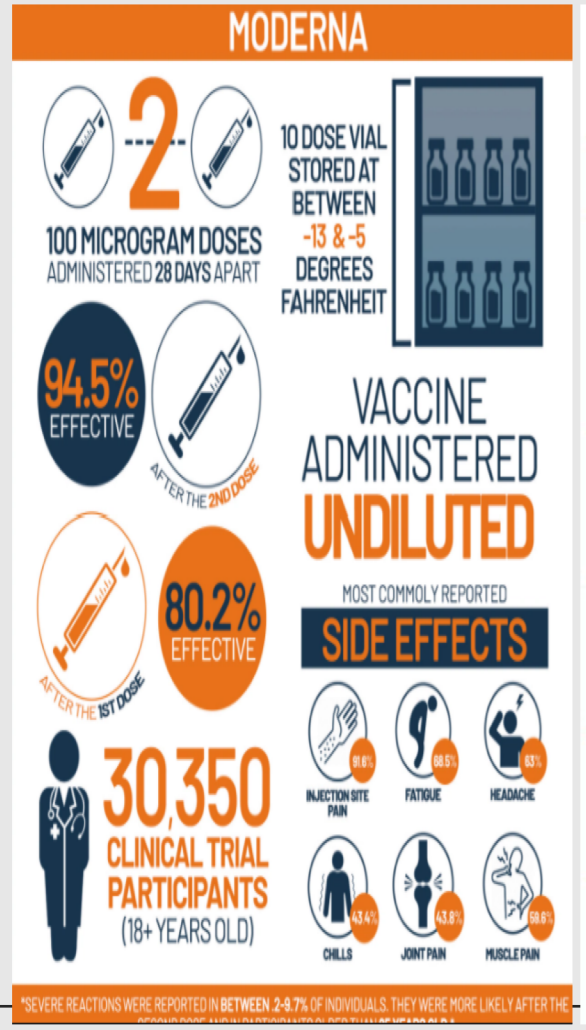
DNA IN AN ADNOVIRUS PLATFORM

OTHER VACCINE PLATFORMS

How Do Vaccines Work

- All vaccines encourage the body to create antibodies, Killer T Cells, and Helper T Cells that recognize the illness causing virus or bacteria (pathogens).
- After the body is trained to recognize the illness causing pathogen, the antibodies and T Cells identify new exposures, inactivating the pathogen before it makes you sick.
- The earliest vaccines were weakened pathogens or viruses or a virus from the same viral family that does not cause as severe of a disease.

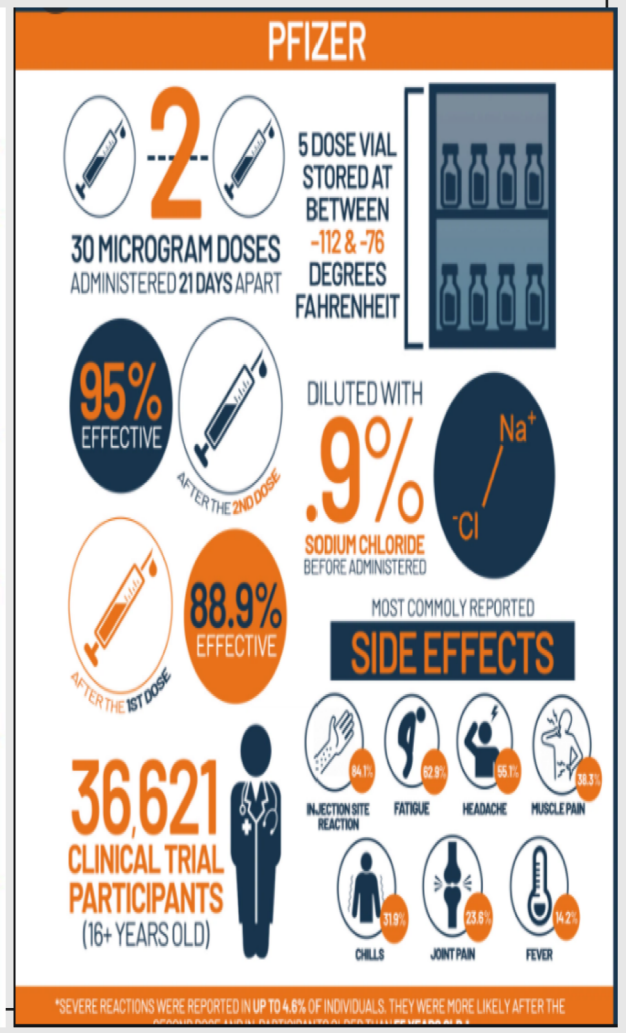
mRNA Vaccine

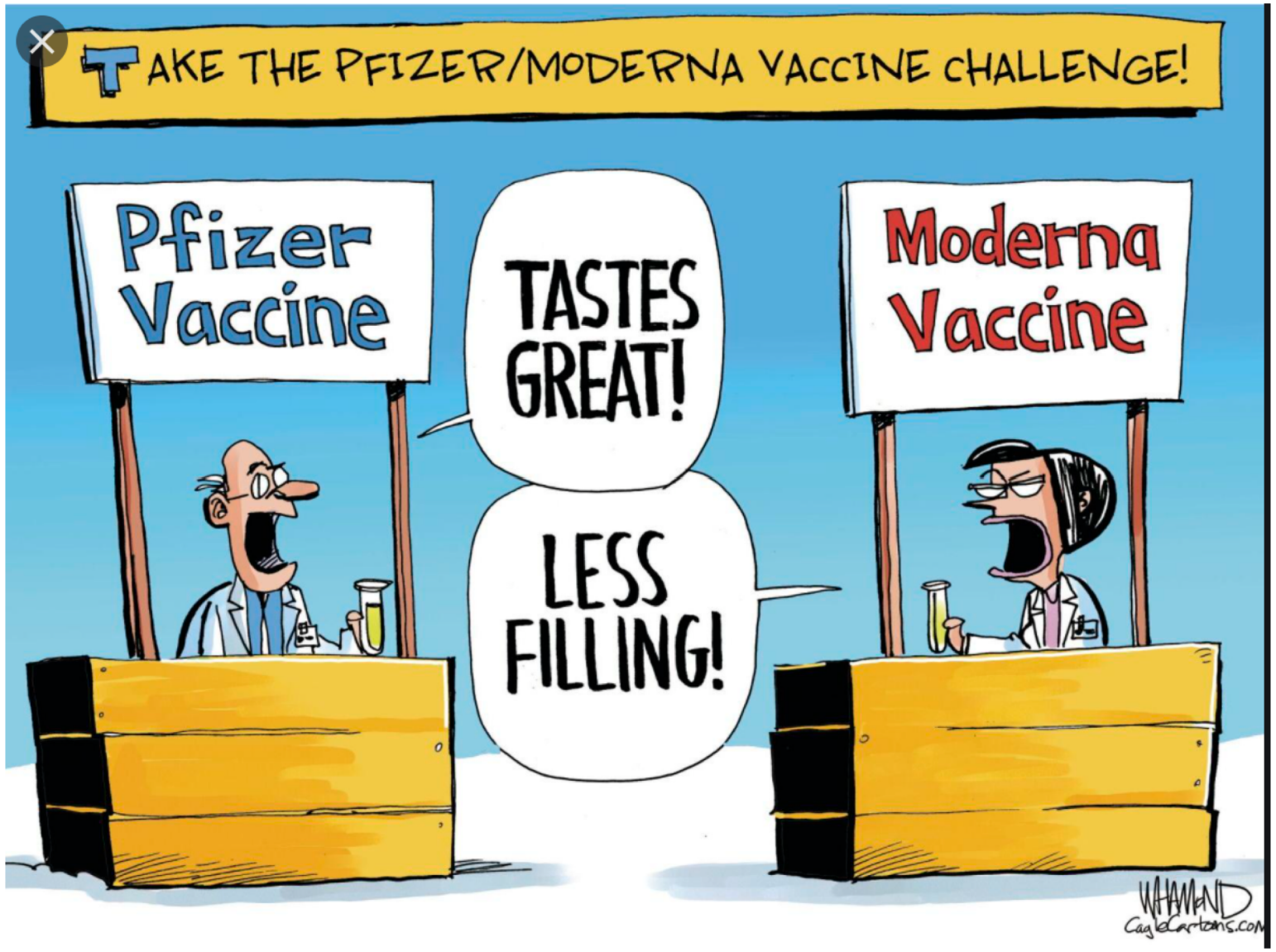


Moderna vs Pfizer Vaccine

Comparison Chart

Moderna Vaccine	Pfizer Vaccine
The vaccine is developed by Massachusetts-based biotechnology firm Moderna Therapeutics in collaboration with National Institute of Allergy and Infectious Diseases.	The vaccine is developed by American pharmaceutical giant Pfizer in partnership with German biotechnology company BioNTech.
Modern's preliminary results suggested a relatively higher efficacy rate at 94.5 percent.	Pfizer claims its vaccine is around 90 percent effective based on preliminary results.
Moderna's first shot is on day 1 and the second shot is on day 29, an additional week than Pfizer's.	Pfizer's first shot is on day 1 and the next injection is on day 22.
Moderna vaccine remains stable at minus 20 degrees Celsius for up to six months.	Pfizer vaccine needs to be kept at ultra-cold storage at about minus 70 degrees Celsius.
Easy for distribution to remote areas that do not have specialized freezers to store the vaccines.	Storage and distribution of Pfizer vaccines can be challenging as they require expensive and specialized refrigeration units.

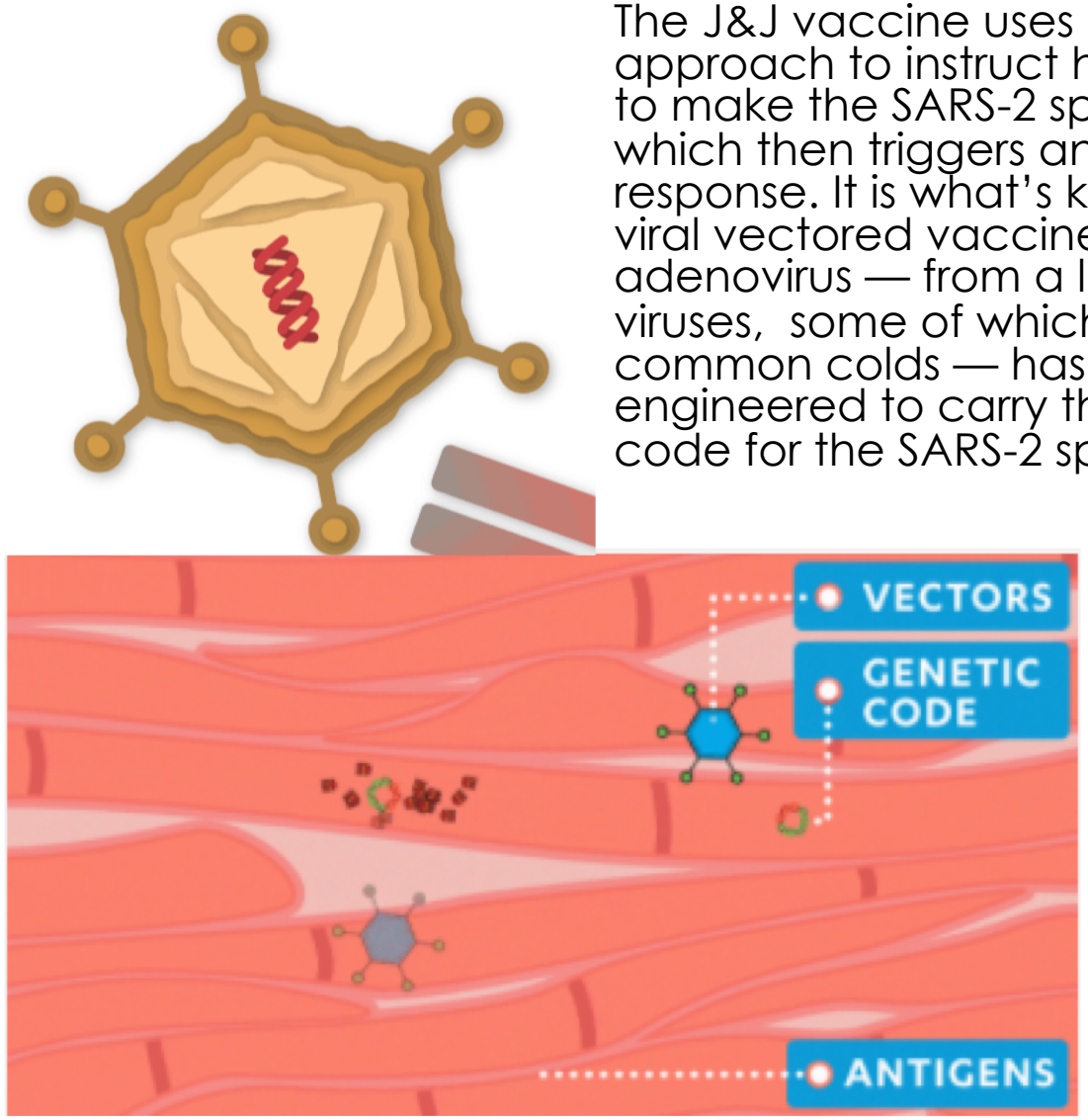




Both are Effective

Both the Moderna Vaccine and the Pfizer Vaccine are equally effective.

Both have similar side effects.



The J&J vaccine uses a different approach to instruct human cells to make the SARS-2 spike protein, which then triggers an immune response. It is what's known as a viral vectored vaccine. A harmless adenovirus — from a large family of viruses, some of which cause common colds — has been engineered to carry the genetic code for the SARS-2 spike protein.

What about the Johnson & Johnson Vaccine

Viral Vector Vaccine: The AdVac® technology works by using an adenovirus as a vector (a carrier) of an antigen's genetic code, to mimic components of a pathogen (a bacterium, virus, or other disease-causing organism). Antigens (components of a pathogen) are produced to mimic the pathogen, without causing severe disease.

- Early investigations are suggesting the current vaccines, as well as Johnson & Johnson's candidate vaccine (not yet authorized for use), may be somewhat less effective against some of the new variants, in terms of preventing all symptoms. But even against the variants, the vaccines do prevent a lot of mild and moderate cases, the data gathered so far suggest, and are very effective, health officials say, against preventing severe cases, hospitalizations and deaths.
- mRNA vaccines can be 'adjusted' to protect people against new variants very rapidly because the manufacturing doesn't change.

What about New Variants?

New FDA guidelines allowing COVID vaccine makers to bypass clinical trial requirements for the authorization of modified shots.

Instead of conducting large-scale trials, manufacturers will only need to show that their vaccines are safe and produce a similar response to the original.

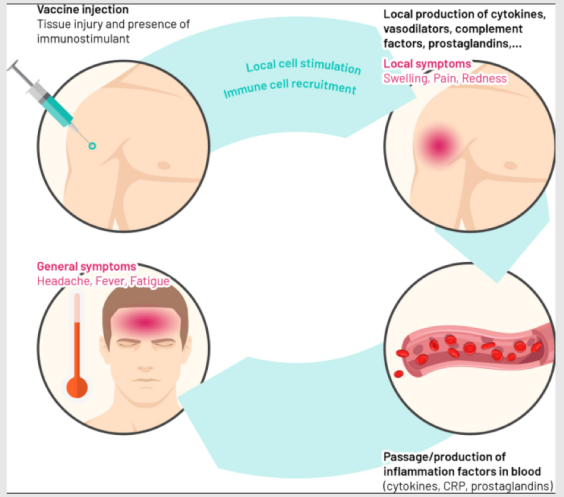
This process is more similar to the annual approval of flu shot updates than the lengthy authorization of the first COVID vaccines.

Quickly developing modified COVID vaccines is especially important as new variants, specifically B.1.351, threaten vaccine efficacy.

So far, both Pfizer and Moderna have announced plans to modify their vaccines to target new variants.

Side Effects of COVID Vaccination

- Side effects are similar to any adult vaccination
- Side effects are generally more pronounced after the second injection
- Some individuals who have had COVID-19 will have increased side effects with the first vaccine
- Plan your vaccination dates accordingly – be able to have a ‘day off’ after your vaccination if needed.



- Side Effects
  - Local Reaction
    - Pain
    - Redness
    - Swelling
  - Generalized Reaction
    - Fatigue
    - Muscle Aches
    - Headache
    - Chills
    - Fever
    - GI issues - nausea
- Side effects can occur 12 – 48 hours after injection

MYTHS ABOUT COVID VACCINE

- Can a COVID-19 vaccine make me sick with COVID-19? No
- After getting a COVID-19 vaccine, will I test positive for COVID-19 on a viral test? No
- Will a COVID-19 vaccine alter my DNA? No
- If I have already had COVID-19 and recovered, do I still need to get vaccinated with a COVID-19 vaccine? Yes
- Will a COVID-19 vaccination protect me from getting sick with COVID-19? Yes
- Is it safe for me to get a COVID-19 vaccine if I would like to have a baby one day? Yes

Other Vaccine Platforms

- Weakened Virus Vaccine
  - The real virus is weakened (heated, treated with chemicals)
  - The oldest technology for vaccine development
    - MMR
    - FluMist Nasal Vaccine
- Subunit Vaccine
  - Flu vaccine
    - Virus is grown in eggs or cell lines. Virus is then ruptured to render it non-infectious.
  - Hepatitis B Vaccine
    - Protein is grown in yeast cells
  - Tetanus Vaccine
- Viral Vector Vaccine
  - A harmless virus is used as a transport for spike protein
  - Less difficult to transport. More stable.
    - Oxford-AstraZenica
      - May be safer in children
    - Sputnik V
    - Sinopharm and Sinovac both have viral vector vaccines

AIR FILTRATION IN THE BATTLE AGAINST COVID

Other Tools in the Tool Box

Medify Air Model MA-112

Home & Kitchen › Heating, Cooling & Air Quality › Air Purifiers › HEPA Air Purifiers

Roll over image to zoom in

Medify Air MA-112 V2.0 Air Purifier with H13 HEPA filter - a higher grade of HEPA | Covers 2,400 sq ft - Allergies, Smog, Odors, Smoke, Pets Dander, Dust | Dual intake with 2 filters

Visit the Medify Air Store

4.5 out of 5 stars 482 ratings

Price: $495.00 & **FREE Shipping**

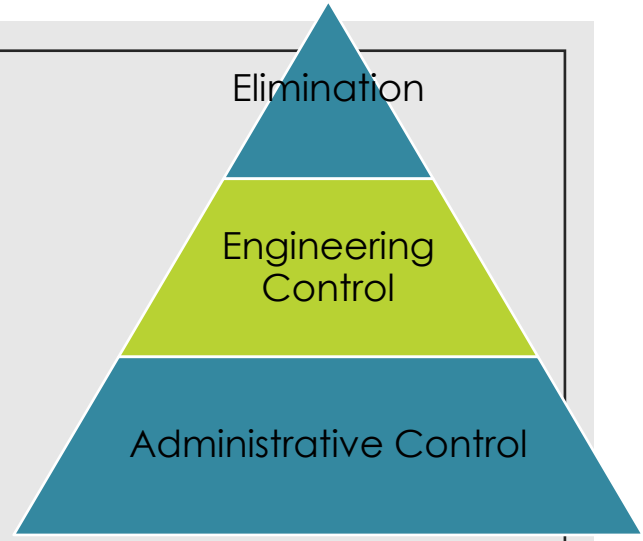
Pay $41.25/month for 12 months, interest-free with your Amazon Prime Rewards Visa Card

Size: **1-Pack**

- Highest CADR 950 & Sq Ft (3,700) coverage on the market for the price.
- A higher grade of HEPA - H13 Filters (higher rated than True HEPA) 99.9% particle removal.
- Easily cleans up to 3,700 sq ft in one hour, 2,500 sq ft in 30 minutes, 1,250 sq ft in 15 minutes (CADR 950). This allows you to run the unit on lower speeds and still easily clean the air in your rooms.
- Touch screen panel, 4 fan speeds, ionizer function can be turned on/off, sleep mode, and child lock.
- CARB, ETL & Energy Star certified, Genuine Medify M-112 Replacement Filter: B07MTQKJ14, 110 Volt units, USA registered Lifetime Warranty

COVID-19 Area Risk Management

FM = Filtration Media Type



Filters with MERV ratings of 13 and higher mitigate the transmission of infectious aerosols and capture airborne viruses in 0.3-1 micron diameter size

Variable	Viral Mitigation Effectiveness
MERV 1-4	3%
MERV 5-8	15%
MERV 9-11	35%
MERV 12-13	50%
MERV 14-15	70%
Confidence Factor	**85%**

Minimum Efficiency Reporting Values - MERV ratings

MERV Value	The filter will trap Average Particle Size Effiency 0.3 - 1.0 Microns	The filter will trap Average Particle Size Effiency 1.0 - 3.0 Microns	The filter will trap Average Particle Size Effiency 3 - 10 Microns	Types of things these filters will trap
MERV 1	-	-	Less than 20%	Pollen, Dust mites, Standing Dust, Spray Paint Dust, Carpet Fibers
MERV 2	-	-	Less than 20%	
MERV 3	-	-	Less than 20%	
MERV 4	-	-	Less than 20%	
MERV 5	-	-	20% - 34%	Mold Spores, Hair Spray, Fabric Protector, Cement dust
MERV 6	-	-	35% - 49%	
MERV 7	-	-	50% - 69%	
MERV 8	-	-	70% - 85%	
MERV 9	-	Less than 50%	85% or better	Humidifier Dust, Lead Dust, Auto Emissions, Milled Flour
MERV 10	-	50% - 64%	85% or better	
MERV 11	-	65% - 79%	85% or better	
MERV 12	-	80% - 89%	90% or better	
MERV 13	Less than 75%	90% or better	90% or better	Bacteria, Most Tobacco Smoke, Proplet Nuceli (sneeze)
MERV 14	75% - 84%	90% or better	90% or better	
MERV 15	85% - 94%	90% or better	90% or better	
MERV 16	95% or better	90% or better	90% or better	

ASHRAE Epidemic Task Force. "Filtration/Disinfection, Mechanical Air Filters".

Medify MA-112 V2.0 Specifications:

Filtration: Pre-filter, HEPA, and Carbon filter combined in a package x 2 and optional anion generator

HEPA class: H13 True HEPA

Filter life: 2500 hrs (2 filter sets)

Maximum CADR: 950 cubic meter/hr (m3/h) or 560 cubic feet/minute (cfm)

Sensor: Particle sensor removed from version 2.0, ambient light sensor

Room Coverage: 2400 sq ft with 2 air changes/hr, 840 sq ft with 5 air changes per hour (ACH)

Number of fan speeds: 4

Automatic mode: No (removed from V2.0)

Size: 28.3"H x 15.7"W x 15.4"D

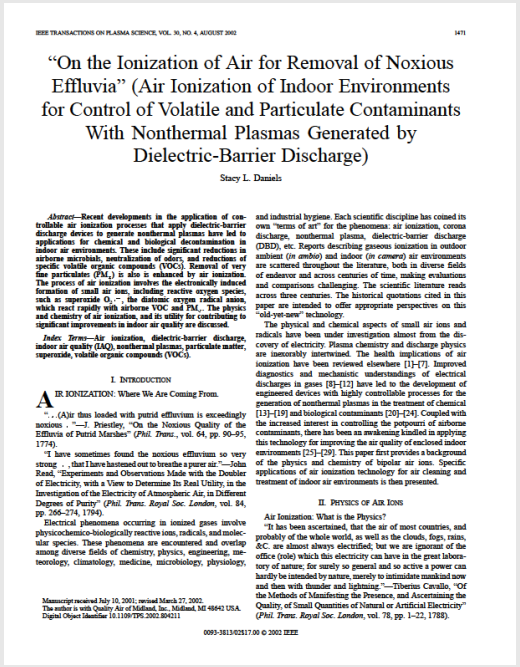
Device weight: 33.5 lbs

Maximum Noise level: <70 dB(A)

Rated power: 95 W

Voltage: 110-120 V AC 60 Hz

Supporting Articles



IEEE TRANSACTIONS ON PLASMA SCIENCE, VOL. 30, NO. 4, AUGUST 2002 1471

"On the Ionization of Air for Removal of Noxious Effluvia" (Air Ionization of Indoor Environments for Control of Volatile and Particulate Contaminants With Nonthermal Plasmas Generated by Dielectric-Barrier Discharge)

Stacy L. Daniels

Abstract—**Recent developments in the application of controllable air ionization processes that apply dielectric-barrier discharge devices to generate nonthermal plasmas have led to applications for chemical and biological decontamination in indoor air environments. These include significant reductions in airborne microbial, neutralization of odors, and reductions of specific volatile organic compounds (VOCs). Removal of very fine particulates ($PM_{2.5}$) is also is enhanced by air ionization. The process of air ionization involves the electronically induced formation of small air ions, including reactive oxygen species, such as superoxide $O_2^{\cdot-}$, the diatomic oxygen radical anion, which react rapidly with airborne VOC and $PM_{2.5}$. The physics and chemistry of air ionization, and its utility for contributing to significant improvements in indoor air quality are discussed.**

Index Terms—**Air ionization, dielectric-barrier discharge, indoor air quality (IAQ), nonthermal plasmas, particulate matter, superoxide, volatile organic compounds (VOCs).**

I. Introduction

AIR IONIZATION: Where We Are Coming From.

". . . (A)ir thus loaded with putrid effluvium is exceedingly noxious . . ."—J. Priestley, "On the Noxious Quality of the Effluvia of Putrid Marshes" (*Phil. Trans.*, vol. 64, pp. 90–95, 1774).

"I have sometimes found the noxious effluvium so very strong . . . that I have hastened out to breathe a purer air."—John Read, "Experiments and Observations Made with the Doubler of Electricity, with a View to Determine Its Real Utility, in the Investigation of the Electricity of Atmospheric Air, in Different Degrees of Purity" (*Phil. Trans. Royal Soc. London*, vol. 84, pp. 266–274, 1794).

Electrical phenomena occurring in ionized gases involve physicochemico-biologically reactive ions, radicals, and molecular species. These phenomena are encountered and overlap among diverse fields of chemistry, physics, engineering, meteorology, climatology, medicine, microbiology, physiology, and industrial hygiene. Each scientific discipline has coined its own "terms of art" for the phenomena: air ionization, corona discharge, nonthermal plasma, dielectric-barrier discharge (DBD), etc. Reports describing gaseous ionization in outdoor ambient (*in ambio*) and indoor (*in camera*) air environments are scattered throughout the literature, both in diverse fields of endeavor and across centuries of time, making evaluations and comparisons challenging. The scientific literature reads across three centuries. The historical quotations cited in this paper are intended to offer appropriate perspectives on this "old-yet-new" technology.

The physical and chemical aspects of small air ions and radicals have been under investigation almost from the discovery of electricity. Plasma chemistry and discharge physics are inexorably intertwined. The health implications of air ionization have been reviewed elsewhere [1]–[7]. Improved diagnostics and mechanistic understandings of electrical discharges in gases [8]–[12] have led to the development of engineered devices with highly controllable processes for the generation of nonthermal plasmas in the treatment of chemical [13]–[19] and biological contaminants [20]–[24]. Coupled with the increased interest in controlling the potpourri of airborne contaminants, there has been an awakening kindled in applying this technology for improving the air quality of enclosed indoor environments [25]–[29]. This paper first provides a background of the physics and chemistry of bipolar air ions. Specific applications of air ionization technology for air cleaning and treatment of indoor air environments is then presented.

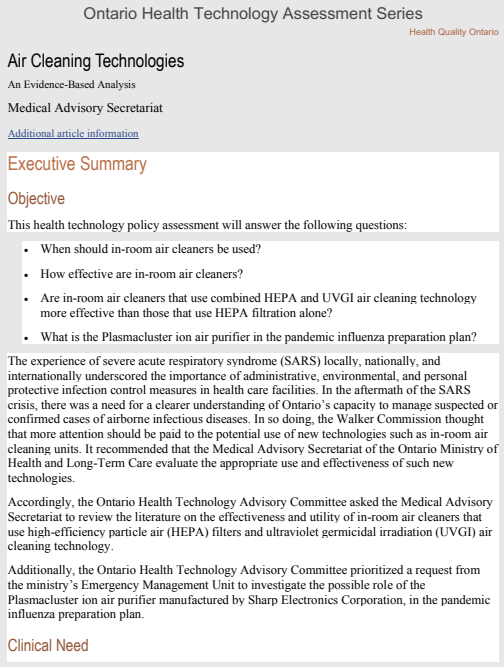
II. Physics of Air Ions

Air Ionization: What is the Physics?

"It has been ascertained, that the air of most countries, and probably of the whole world, as well as the clouds, fogs, rains, &C. are almost always electrified; but we are ignorant of the office (role) which this electricity can have in the great laboratory of nature, for surely so general and so active a power can hardly be intended by nature, merely to intimidate mankind now and then with thunder and lightning."—Tiberius Cavallo, "Of the Methods of Manifesting the Presence, and Ascertaining the Quality, of Small Quantities of Natural or Artificial Electricity" (*Phil. Trans. Royal Soc. London*, vol. 78, pp. 1–22, 1788).

Manuscript received July 10, 2001; revised March 27, 2002.
The author is with Quality Air of Midland, Inc., Midland, MI 48642 USA.
Digital Object Identifier 10.1109/TPS.2002.804211

0093-3813/02$17.00 © 2002 IEEE



Ontario Health Technology Assessment Series

Health Quality Ontario

Air Cleaning Technologies

An Evidence-Based Analysis

Medical Advisory Secretariat

Additional article information

Executive Summary

Objective

This health technology policy assessment will answer the following questions:

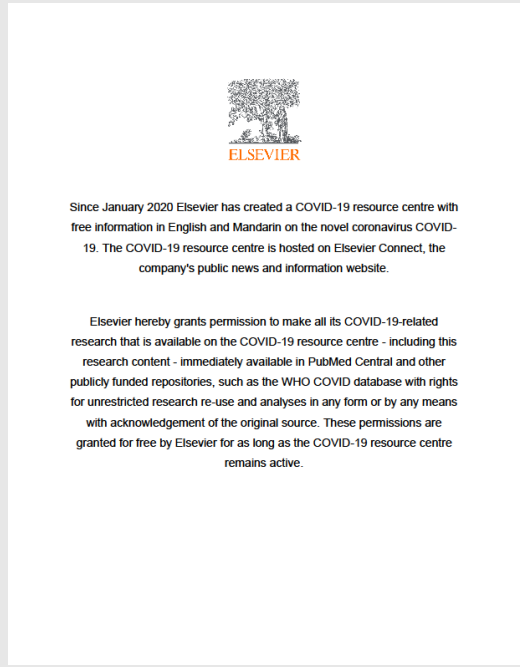
- When should in-room air cleaners be used?
- How effective are in-room air cleaners?
- Are in-room air cleaners that use combined HEPA and UVGI air cleaning technology more effective than those that use HEPA filtration alone?
- What is the Plasmacluster ion air purifier in the pandemic influenza preparation plan?

The experience of severe acute respiratory syndrome (SARS) locally, nationally, and internationally underscored the importance of administrative, environmental, and personal protective infection control measures in health care facilities. In the aftermath of the SARS crisis, there was a need for a clearer understanding of Ontario's capacity to manage suspected or confirmed cases of airborne infectious diseases. In so doing, the Walker Commission thought that more attention should be paid to the potential use of new technologies such as in-room air cleaning units. It recommended that the Medical Advisory Secretariat of the Ontario Ministry of Health and Long-Term Care evaluate the appropriate use and effectiveness of such new technologies.

Accordingly, the Ontario Health Technology Advisory Committee asked the Medical Advisory Secretariat to review the literature on the effectiveness and utility of in-room air cleaners that use high-efficiency particle air (HEPA) filters and ultraviolet germicidal irradiation (UVGI) air cleaning technology.

Additionally, the Ontario Health Technology Advisory Committee prioritized a request from the ministry's Emergency Management Unit to investigate the possible role of the Plasmacluster ion air purifier manufactured by Sharp Electronics Corporation, in the pandemic influenza preparation plan.

Clinical Need



ELSEVIER

Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.

NCBI

Skip to main content

Skip to navigation

Resources

How To

About NCBI Accesskeys

PMC

US National Library of Medicine

National Institutes of Health

Search database PMC

Search term

Search

Advanced

Journal list

Help

COVID-19 is an emerging, rapidly evolving situation.

Public health information (CDC)

Research information (NIH)

SARS-CoV-2 data (NCBI)

Prevention and treatment information (HHS)

Journal List

Lung India

v.32(5); Sep-Oct 2015

PMC4587002

Official publication of Indian Chest Society

Lung India

Home

Current issue

Instructions

Submit article

Lung India. 2015 Sep-Oct; 32(5): 473–479.

doi: 10.4103/0970-2113.164174

PMCID: PMC4587002

PMID: 26628762

Enhancing indoor air quality –The air filter advantage

Vannan Kandi Vijayan, Haralappa Paramesh,[1] Sundeep Santosh Salvi,[2] and Alpa Anil Kumar Dalal[3]