Swine H1NI Influenza A:

Transmission of Viruses in Indoor Air: HVAC System Protection Options

Federal Interagency Committee for Indoor Air Quality

Environmental Protection Agency

June 3, 2009

Steven Welty CAFS, CIE, LEED AP

Green Clean Air Reston, VA

703.927.7532 GreenCleanAir@aol.com

The Swine Flu "Pandemic" demonstrated just how fast and far influenza can travel to Infect and Kill innocent victims.

Some of the highlights so far:

- 99 deaths
- 15,000 infections
- "Funny" swine flu fooled experts with low fatality rate*
- Experts acknowledged that "sanitizing surfaces" of schools where occupants had contacted the swine flu was an basically worthless exercise
- China demonstrated the success of vigilant airline passenger surveillance and quarantine
- No one really explained how airborne transmission occurs and what proactive protection measures one could take to mitigate exposure besides face masks.

*Washington Post 5.31.09

Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com

Bacteria vs Viruses-
Know your Airborne Germ

Bacteria

1. Living Cells
2. Need moisture
3. Most need Oxygen
4. Need Nutrients to Reproduce
5. Grow by cell division
6. Some can self propel

Viruses

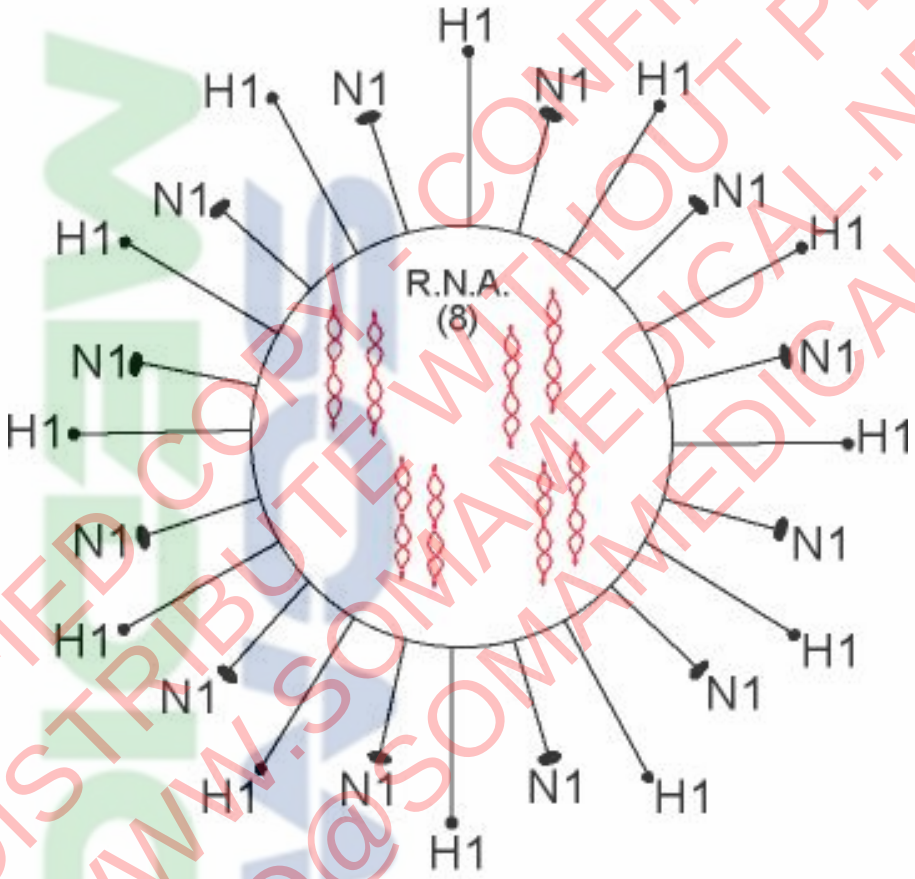
1. Not "Living" Cells-Inert DNA/RNA in a protein shell
2. Do Not Need moisture
3. Do Not need Oxygen
4. Do Not Need Nutrients to stay Viable
5. Do Not Grow by cell division
6. Do Not self propel

How many Anthrax Bacteria do you need to inhale to kill you?
How many Flu Viruses do you need to inhale to kill you?

Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com

H1N1

Swine Influenza Virus

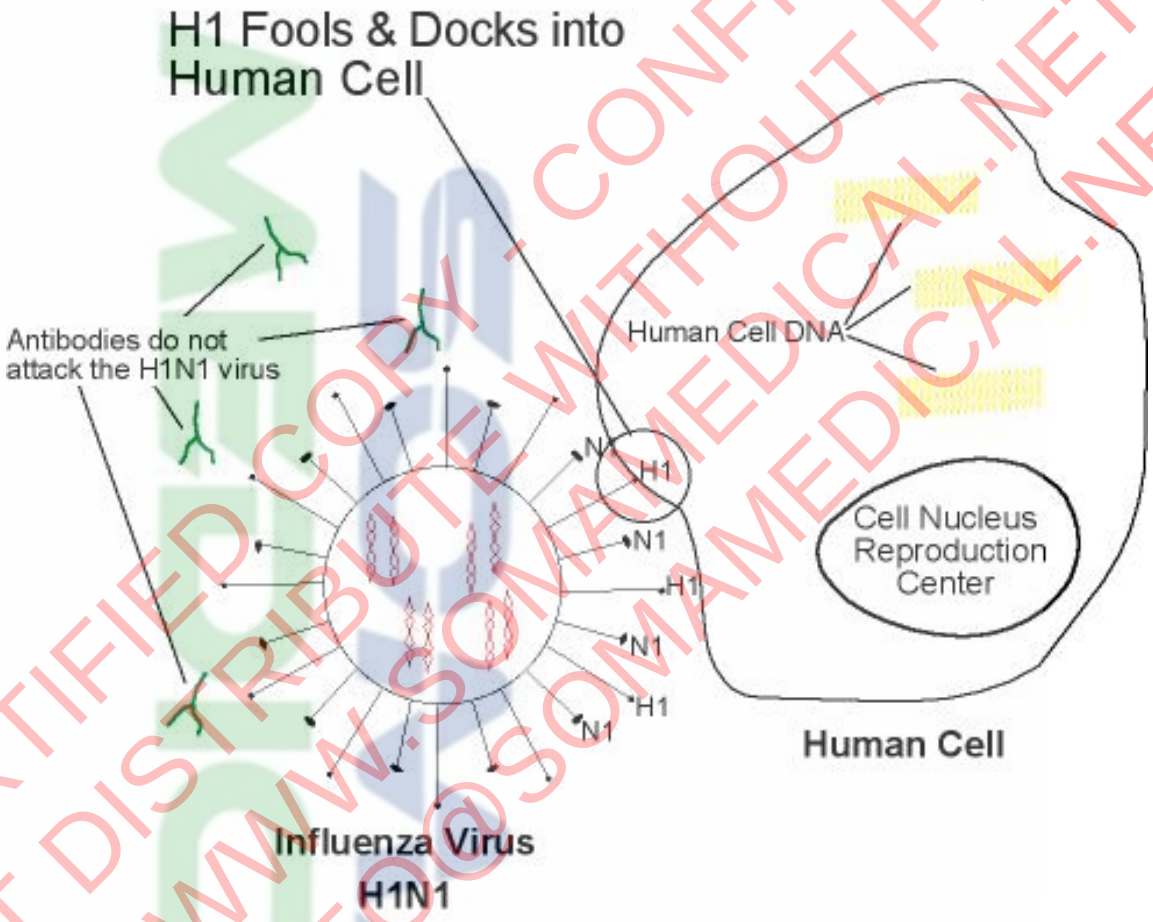


(1)

Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com

H1N1 Begins Infecting Cell

(Rings Door Bell)



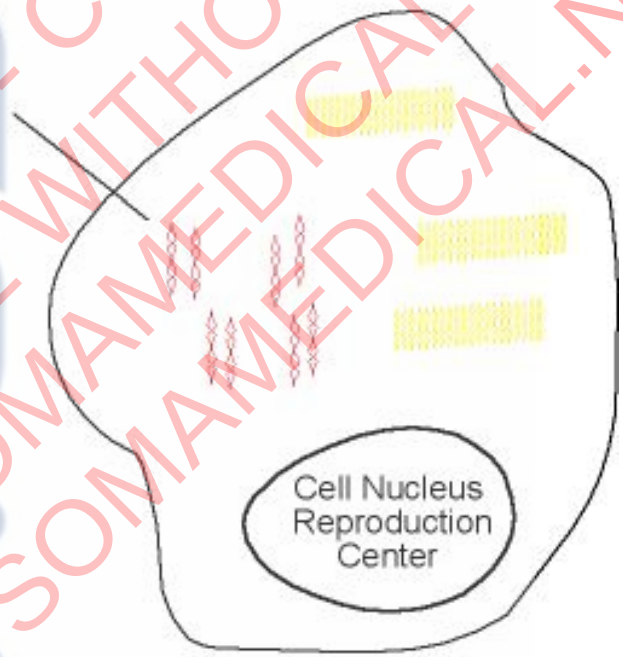
(2)

Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com

H1N1 Enters Infected Cells

(Cell open door & lets H1N1 Inside)

Once inside, H1N1 Sheds its H's & N's and its capsule shell leaving its RNA to head towards the Cell's Nucleus Reproduction Center to start making clones of itself.

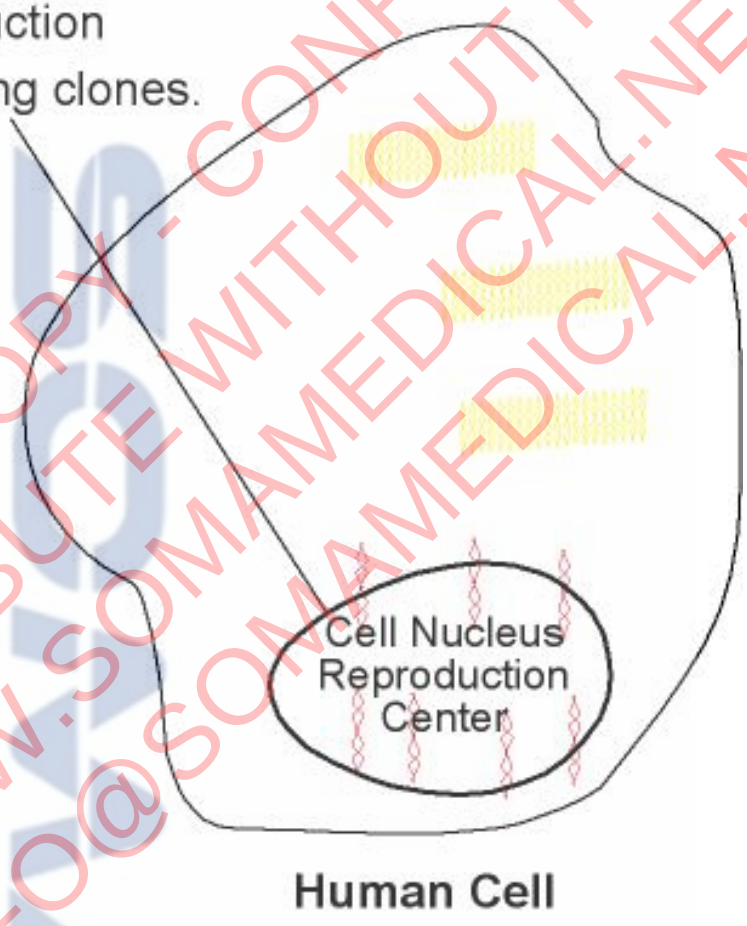


Human Cell

Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com

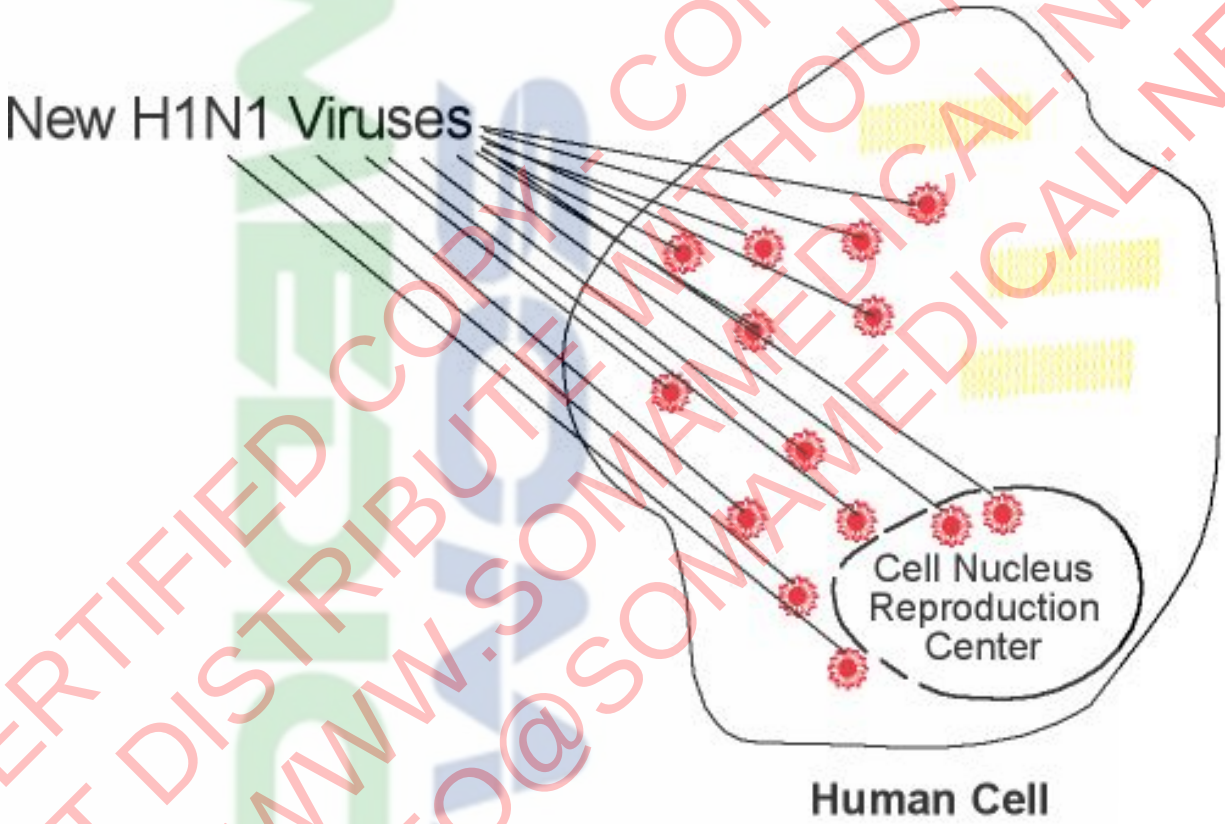
H1N1 RNA invades Cell's Reproduction Center

The H1N1 RNA invades Cell's Nucleus Reproduction Center and starts making clones.



Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com

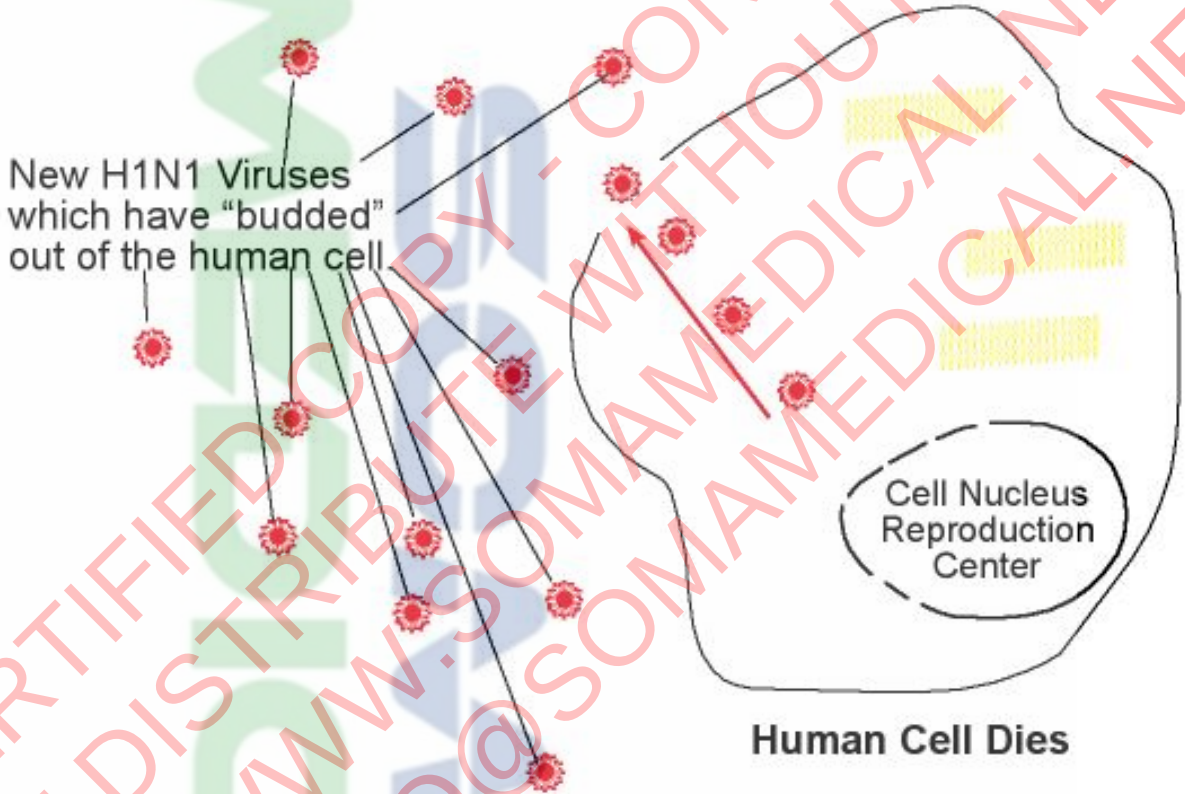
Cell's Reproduction Center creates new **H1N1** Virus Clones



(5)

Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com

Viruses "Bud" Out of Hijacked Cell which dies. They then Invade the Human Body by Infecting more Cells and creating more Clones.



Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com

What's Influenza A Virus & How does it infect people?

Influenza A causes disease primarily in the lungs as it loves to infect the lower respiratory system.

It is not a rhinovirus which primarily causes infection in the nose and upper respiratory system.

Since your fingers can't touch your lungs, washing your hands won't likely prevent flu viruses from entering deep into your lungs.

NO matter how sterile your hands are, you'll still be fully exposed to airborne Influenza viruses entering and depositing into your lungs to cause disease.

Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com

How does Influenza A Virus kill people?

Influenza A likes to multiply at 98.6° which is the temperature of the lower respiratory system. (The upper respiratory system- nasal cavity & pharynx- are approx. 93° which rhinoviruses favor for multiplication).

Influenza A infects and destroys its victim's lung tissue.
Damaged lung tissue has compromised its protective layers which can lead to pneumonia or massive bacterial infection.

Victims may die from aggressive Staph infections like Methicillin Resistant Staphylococcus Aureus (MRSA).

Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com

While Studies have shown that airborne viruses are everywhere, finding and proving that within an indoor space is very challenging

As an Indoor Air Quality (IAQ) testing consultant, I can attest to the difficultly of trying to isolate airborne germs. As Harvard's Don Milton said: "infectious aerosols are usually extremely dilute, and it is hard to collect and culture fine particles." NEJM 4.22.04

The testing equipment has changed little in the past 100 years and the challenge of finding airborne germs is daunting and expensive.

In addition, there still is no internationally accepted Indoor Air Quality standard for germs except in cleanrooms, hospital operating rooms & intensive care wards.

Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com

If I'm now infected with the H1N1 Swine Flu Virus……

1. How long will it take me to infect everyone in this room?

2. How long will it take for me to infect everyone in this building?

Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com

Public Health Officials advice on preventing the Swine Flu Contagion:

1. Wash your hands.
2. Cover your cough.
3. If you're sick, stay home.

This advice ignores studies showing that 30-50% of infected influenza carriers have NO symptoms.

It also ignores both human airway and toilet water viral aerosolization. These both are critical modes of airborne contagion within indoor spaces.

Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com

Here's a short list of Human Indoor Airborne Virus Transmission Issues:

1. How can people eject Flu Viruses into the Air?
2. What different forms can airborne viruses take?
3. How far can those viruses travel & how can they circulate within buildings and inside their HVAC units?
4. What conditions increase Airborne Flu Viruses Survival?
5. What Systems are Available to Sterilize, Capture and/or Kill Airborne Flu Viruses?

Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com

Airborne Transmission depends on people to launch viruses into the air. People can shed this many Flu Viruses into the air:

1. Coughing	3,000+	
2. Sneezing	3,000+	
3. Breathing	Nose-None	Mouth-Varies
4. Talking/Singing	1,000+	
5. Vomiting	1,000+	
6. Diarrhea*	20,000+	

*As a Result of Toilet Water Aerosolization

Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com

How far can Airborne Viruses Travel?

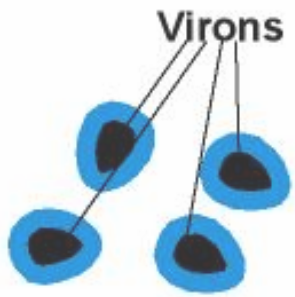
	Large/Small Droplets	Droplet Nuclei
1. Coughing	1-5 feet	160+ feet
2. Sneezing	8-15 feet	160+ feet
3. Singing, Talking	1-3 feet	160+ feet
4. Mouth Breathing	1-3 feet	160+ feet
5. Diarrhea*	5 feet+	160+ feet

*As a Result of Toilet Water Aerosolization and Mechanical Fan Dispersion into outdoor air (2003 Hong Kong SARS Virus Epidemic)

Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com

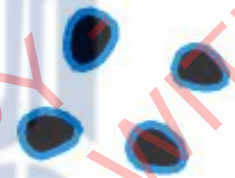
Stages of Infectious Droplets & Droplet Nuclei

Large Infectious droplets



1. Mucus/water encased Viruses are aerosolized by the infector or by toilet water. These quickly fall to the ground after traveling up to 1-3 feet.

Small Infectious droplets



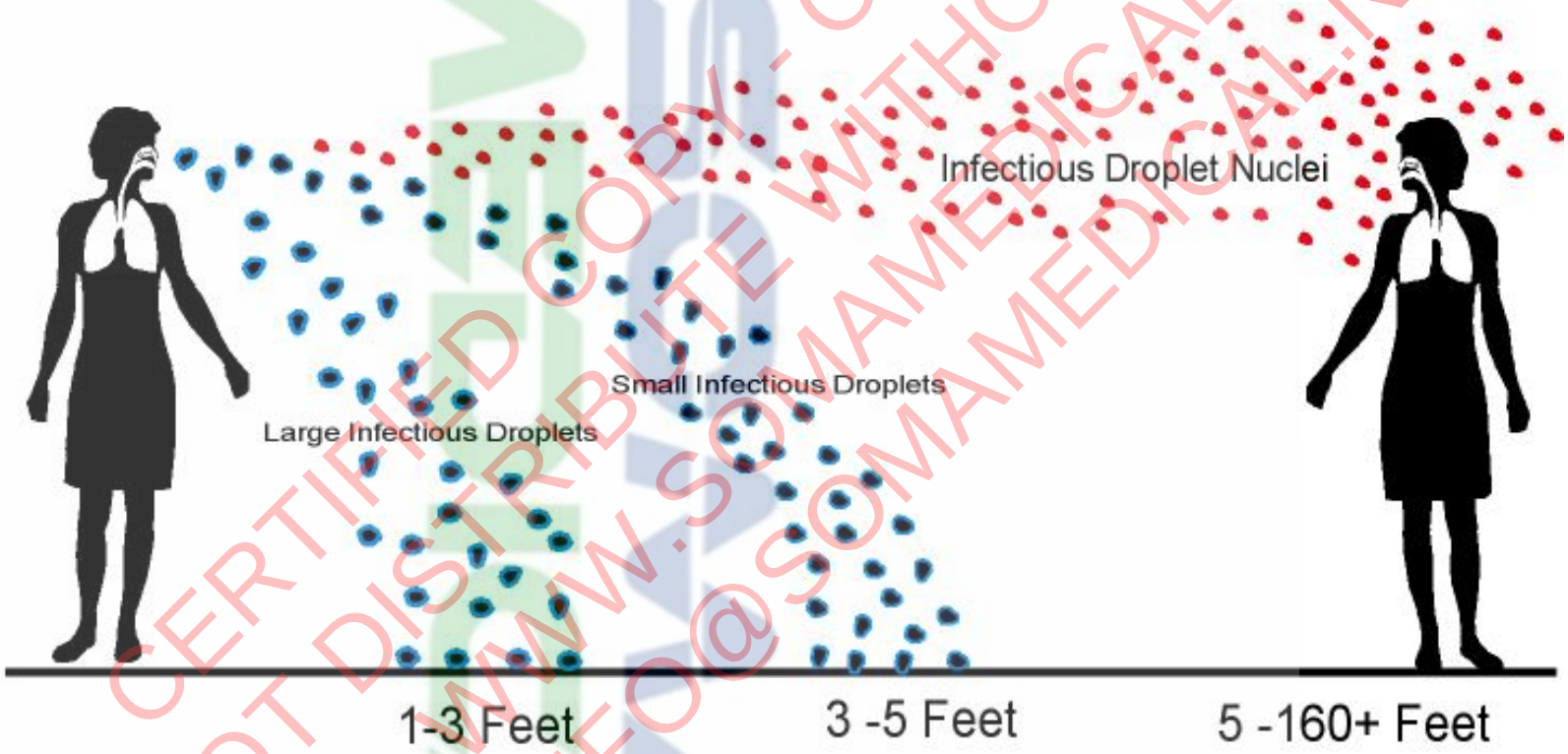
2. Mucus/water coating starts to evaporate. These will travel 3-5 feet before falling to the ground. These droplets can become droplet nuclei.

Infectious Droplet Nuclei

3. Mucus/water coating has totally evaporated leaving only the viron. This is a **Droplet Nuclei**. Droplet Nuclei are so micro-scopic that they can float in the air indefinitely.

Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com

Infectious Droplets & Droplet Nuclei travel lengths



Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com

Droplet Nuclei Viruses are .3µ or Less & Penetrate Deeply into the Human Lungs

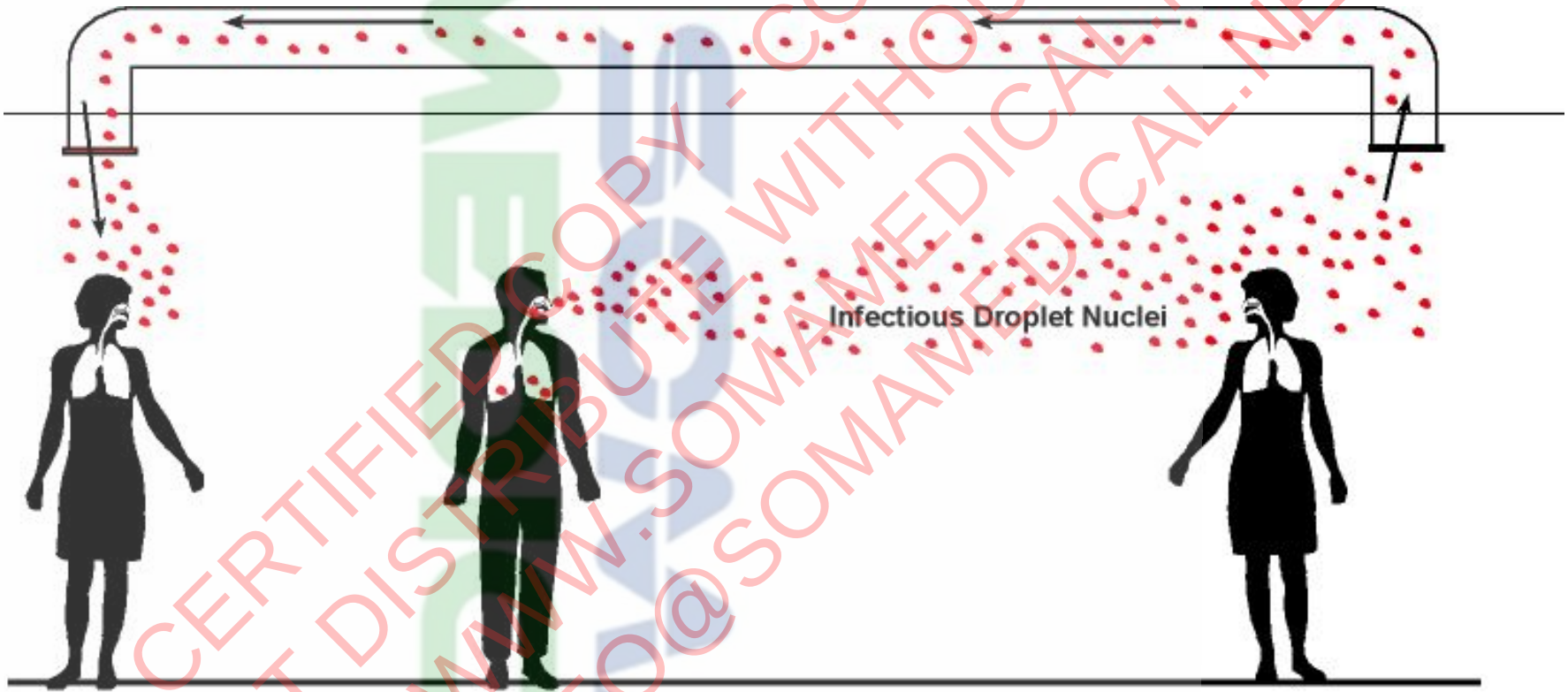
A µm is a micron or 1/1,000,000 of a meter.
The smallest particle you can see is 30µm.

Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com

How do Occupant Aerosolized Droplet Nuclei Travel both within indoor spaces and then throughout a Building?

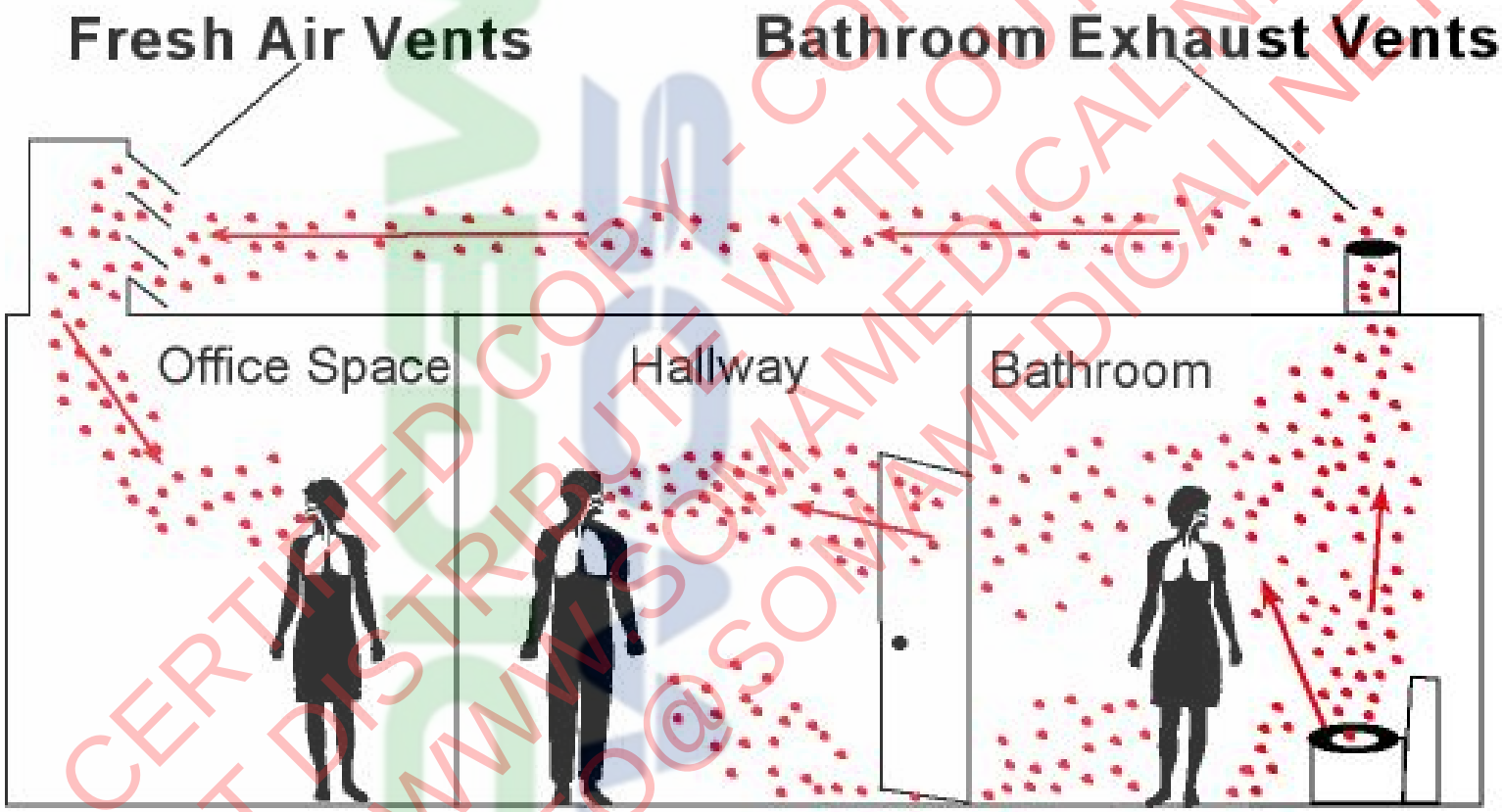
Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com

Droplet Nuclei Travel Within Buildings



Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com

Infectious Droplet Nuclei Recirculation in buildings



Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com

Toilet water Viral Aerosolization

Since 1959, many studies have documented how a toilet flush aerosolizes bacteria and viruses into the air above the bowl….

The scientists flushed toilet bowl water infected with a known quantity of viruses.

British Scientist John Barker in 2005, (post SARS Amoy Garden papers) replicated the viral load and consistency of diarrhea. He added that to toilet water, flushed the toilet and took air samples to capture the aerosolized droplets. They were full of thousands of viruses.

But what surprised him was the fact that for 30 minutes afterwards every flush aerosolized additional viruses. It turns out that porcelain is porous enough to harbor viruses (and bacteria also.)

Both Dr. Liu Jianlun and Wang Kaixi likely had SARS in their Diarrhea.

Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com

Toilet water Viral Aerosolization

The 2003 SARS epidemic showcased the lethality of toilet water aerosolization in these published accounts:

1.Liu Jianlun was the Chinese Doctor who initiated the worldwide SARS epidemic when he stayed in Hong Kong at The Metropole Hotel in February 2003.

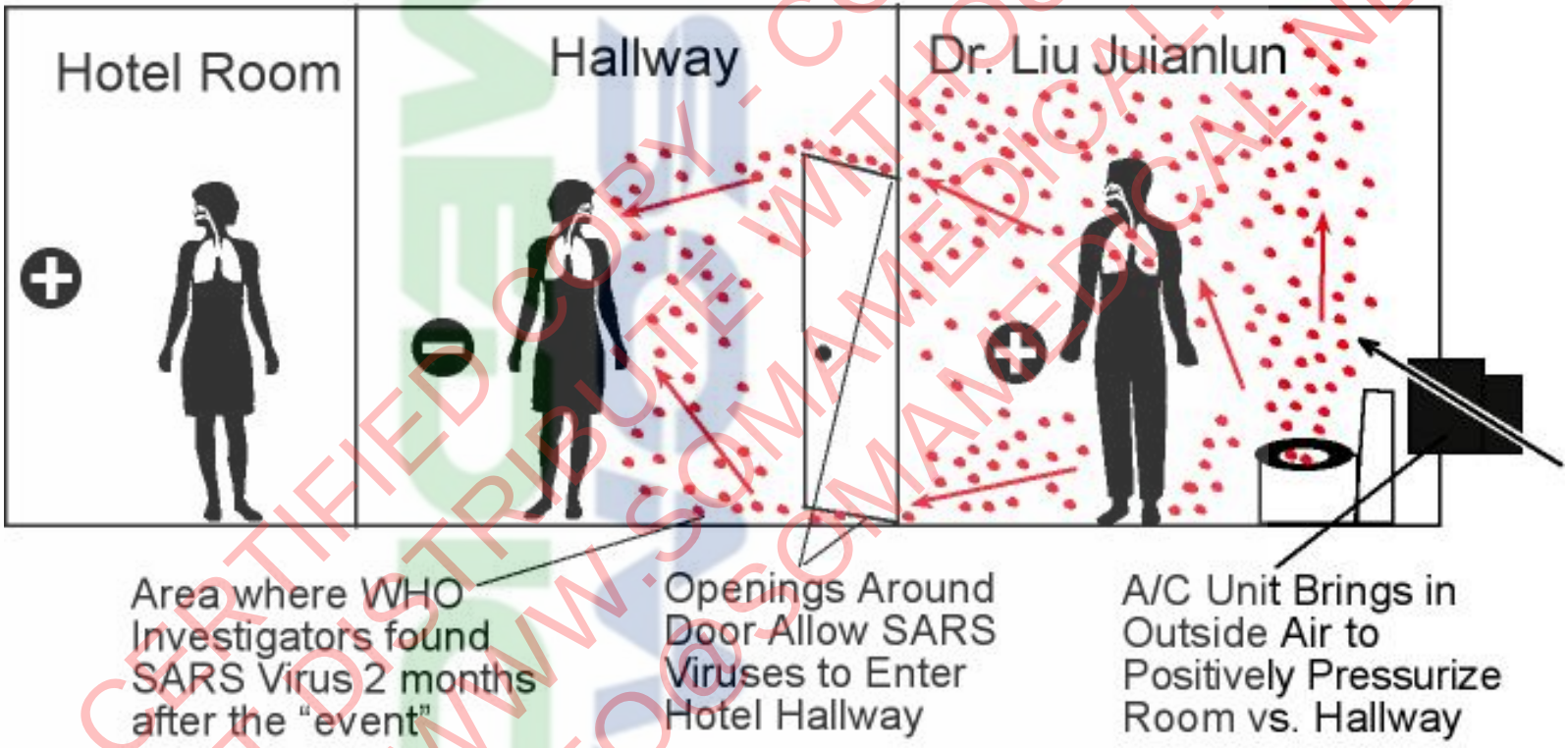
► Infected with SARS and having diarrhea, he probably infected 12 fellow hotel guests through toilet water aerosolization. Those travelers flew around the world and one brought SARS to Toronto thereby devastating the city.

2. Wang Kaixi was infected with SARS at the same hospital which was treating a SARS infected patient who visited a hotel guest's whose room was on the same hall as Liu Jianlun at the Metropole hotel.

► Infected with SARS and having diarrhea, he probably infected over 200 fellow residents through toilet water aerosolization. The twist was many were over 160 feet away from his apartment.

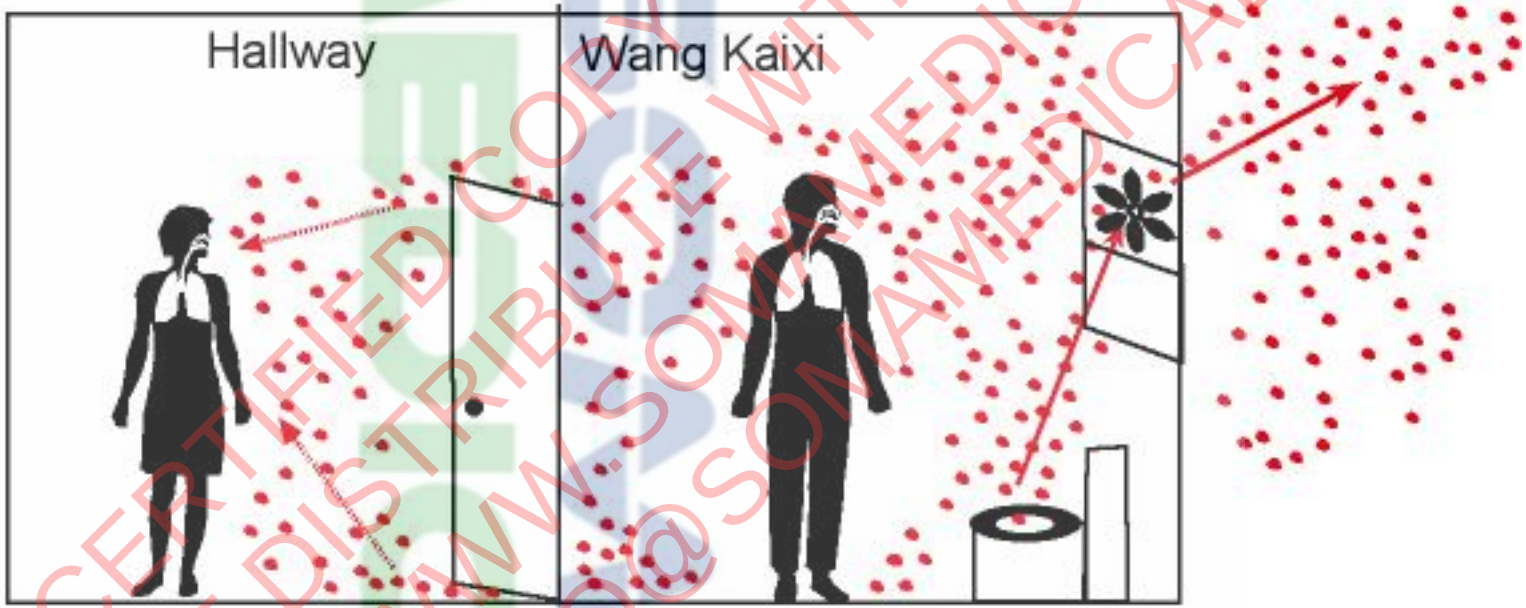
Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com

Airborne SARS Transmission at The Metropole Hotel 02.22.2003



Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com

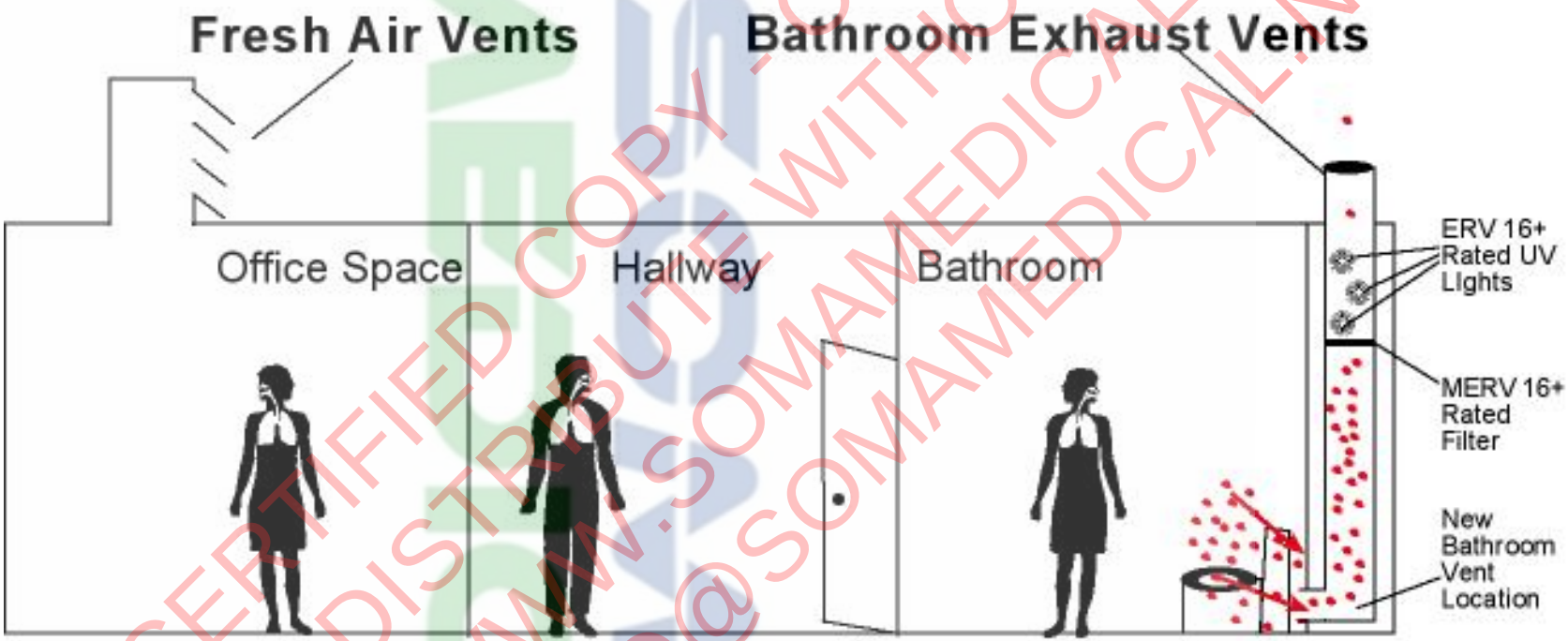
Airborne SARS Transmission at Amoy Gardens Apartments 03.19-20.2003



Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com

Proactive Droplet Nuclei

Infection Prevention



Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com

Why is there a Flu Season??

Does Flu take a vacation each summer?

Are there Flu epidemics in Summer?

What changes in late spring & Summer to reduce flu morbidity and mortality?

Indoor Humidity goes Up!

Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com

Low Indoor Humidity Increases Droplet Nuclei Levels (winter)

- Viruses Evaporate faster in Low Humidity levels thus creating **More** Droplet Nuclei.
- Low humidity allows droplet nuclei to stay airborne longer as the droplets do not absorb water weight which would cause them to fall to the ground.
- Indoor Air currents both created by HVAC systems and people movement assure that droplet nuclei will remain airborne *Indefinitely*.
- This allows HVAC systems to remove and redistribute droplet nuclei throughout the building to infect more occupants.

Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com

There is a DIRECT correlation between low indoor humidity in winter and increases in influenza morbidity and mortality

1. Indoor humidity levels in the Northern Hemisphere especially in North America and Europe are between 15-35%.
2. Studies have proven that there is no “flu season” in the tropics where indoor humidity levels stay above 40% year long.
3. This is logical given the correlation of airborne droplet nuclei creation and available contagion.

Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com

Peer Reviewed Airborne Virus or Bacteria Droplet Nuclei Transmissions Cases

1. Atlanta Pediatric Practice
2. Navy Boats
3. Amoy Gardens
4. Hong Kong Hospital
5. Schools
6. Airplanes

Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com

What Systems are Available to Sterilize, Capture and/or Kill Airborne Flu Viruses?

1. MERV Rated Filters, H.E.P.A.
2. Germicidal UV Lights
3. Magnetized Air Media Filtration
4. Cold Plasma Bi-Polar Ionization
5. Photo-Catalytic Oxidation (PCO)

Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com

Mechanical Filters are like the ones in your home HVAC system

Every school and building has filters within their HVAC system. Many schools have MERV 1 or 2 filters which are nearly worthless in capturing airborne human germs.

The higher the MERV rating, the smaller the germ that they can capture. With a MERV 13 rating, a mechanical filter really reduce airborne contagion.

Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com

How do air filters work?

- **Air Filters are NOT like your screen door mesh!** Forget about the concept that as long as the bug is bigger than the hole in the mesh, he can't get through.

- **Air Filters are more like a thick forest.** The germs sail into the forest and eventually plunk themselves into a tree or vine: Whack!

- A higher **MERV** rating will give you more densely packed trees and vines so you'll capture more germs. (it's more complicated than that but you get the picture)

Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com

Mechanical Air Filters can trap this % of Swine Flu Viruses:

MERV Rating	%Viruses Arrested (captured)
1-5	1-5%
6	6.2%
7	7%
8	11%
10	12%
13	46%
15	71%
16	76%
17 (HEPA)	99.9%

Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com

What is Ultraviolet Light and How does it work?

Ultraviolet Germicidal (germ-killing) light is UV light in the "C" band (254 nanometers). It is invisible and is mostly filtered out our of sunlight before it reaches earth's surface. UV-C light **Sterilizes** germs by destroying the A to T bond in their DNA. This prevents them from reproducing and they soon die.

It was artificially created in the 1880's and later commercially used to kill waterborne viruses & bacteria in France in 1909.

By the 1930's Duke University surgeons were using in in operating rooms to reduce airborne bacterial and viral infections. In the 1930's and 1940's UV light was used in schools to successfully prevent airborne measles epidemics.

Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com

Ultraviolet Light can “Kill”/Sterilize this % of Flu Viruses:

UVR Rating	%Viruses Killed/Sterilized
6- (75mw)	4.4%
7- (100mw)	5.8%
8- (150mw)	8.5%
10- (500mw)	25.7%
13- (2000mw)	69.5%
15- (4000mw)	90.7%
16- (5000mw)	94.9%

Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com

Airborne Flu viruses can be captured & sterilized with a combination of MERV Filter & URV rated UV-C Light

- Adding filters and UV together in successive layers can provide a lethal force to prevent distribution of airborne viruses into occupied spaces.
- A MERV 10 filter alone captures only 10% or flu whereas adding a Ultraviolet rating of 10 triples that total single pass capture/sterilize to 35%.
- A MERV 13 alone catapults to an 84% capture/sterilize rate with the addition of UV light. That is a very achievable goal for any indoor space.
- Adding additional UV lamps can achieve a total single pass capture/sterilize of 99.9%.

Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com

Combined UV Light & Filtration can Kill or Sterilize Flu this % of Viruses:

MERV & UVR Combined	%Viruses Killed/Sterilized
6	10%
7	12%
8	19%
10	35%
13	84%
15	97%
16	98.8%

Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com

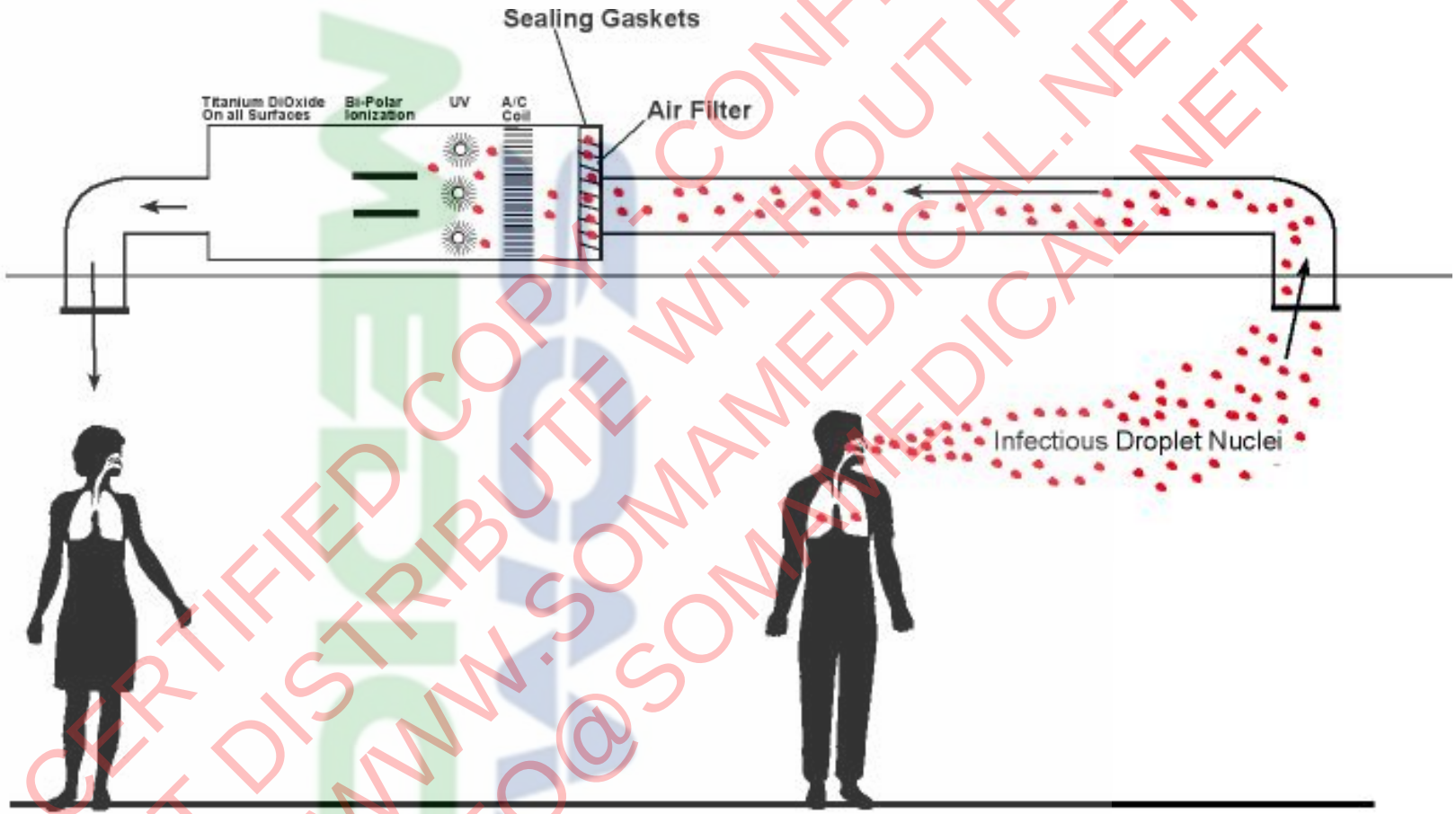
What is Photocatalytic Oxidation (PCO) and Bi-Polar Ionization & How do they work?

Photcatalytic Oxidation is created when Ultraviolet light photons strike Titanium Di-Oxide to create Hydroxyl radicals. These newly liberated airborne Hydroxyl radicals can rupture and destroy the cellular material of any germs which they encounter.

Bi-Polar Ionization is creates positively and negatively charged oxygen molecules which act like hydroxyl radicals and destroy the cell wall and inner cellular material.

Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com

Air Filters, UV Lights, P.C.O. and Bi-Polar Ionization Can Kill, Sterilize & Capture Viral Droplet Nuclei



The % of Influenza captured, sterilized or killed will depend upon the Air Filter's MERV rating, intensity of Ultraviolet Output, the total surface area coated with Titanium Dioxide and the Bi-Polar Ionization Output..

Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com

Documented Cases of Ultraviolet Lights preventing Droplet Nuclei Virus and Bacteria Infection Indoors

1. Germantown Friend's School 1942. Am J Public Health Nations Health. 1943

2. Livermore Veterans Hospital-1957. American Review of Respiratory Diseases. 1961

3. Baltimore Veteran's Hospital-1959. American Journal of Epidemiology. 1961

4. Peru Tuberculosis Ward-2007 Plos Medicine 2008

Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com

Why are Schools such havens for Flu and Viral Transmission?

Dry environments! Many schools have 15-25% relative humidity levels indoors! This is the PERFECT environment for airborne Viral transmission and contagion.

Low MERV Filter Ratings! Many schools have low MERV rated filters like MERV 4-6. You need a MERV 13 or higher to have any real effect on airborne viral capture.

No Ultraviolet Lights! Few schools in the US use ultraviolet lights. Schools with UV lights have enjoyed lower airborne viral transmission rates and higher indoor air quality.

Bathrooms with ceiling exhaust fans! I know of no public bathroom design which incorporates floor level exhaust vents. Wang Kaixi demonstrated the efficiency of toilet aerosolization and dissemination.

Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com

Recommendations….

1. **Seal your filter rack & HVAC system**
2. **Get the highest MERV rated filter that your filter rack and air handling fan can tolerate.**
3. **Put as much UV light within your coil plenum to achieve a 99.9% single pass kill rate.**
4. **Consider Bi-Polar Ionization, Photocatalytic Oxidation and Magnetized Filtration Media Technologies for additional viral sterilization.**
5. **Install bathroom exhausts 1-12” above the floor.**
6. **Coughing/sneezing occupants stay at home or wear a mask.**

Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com

AIrborne Influenza A (H1N1) Building Safety Guide:

These are the calculated Influenza capture and/or sterilization rates in one pass within a surveyed office building

Filter M.E.R.V. Rating -% of Influenza Captured

6	7	8	10	13	15	16	HEPA
6.2%	7%	11%	12%	46%	71%	76%	99.9%

Ultraviolet Irradiation Output -% of Influenza Sterilized

UVR-6 (75mw*)	UVR-7 (100mw)	UVR-8 (150mw)	UVR-10 (500mw)	UVR-13 (2,000mw)	UVR-15 (4,000mw)	UVR-16 (5,000mw)
4.4%	5.8%	8.5%	25.7%	69.5%	90.7%	94.9%

**mw=microwatts*

UV Irradiation & Filters-% of Influenza Sterilized

UVR-6 MERV 6	UVR-7 MERV 7	UVR-8 MERV 8	UVR-10 MERV 10	UVR-13 MERV 13	UVR-15 MERV 15	UVR-16 MERV 16
10%	12%	19%	35%	84%	97%	98.8%

This guide shows how much influenza virus can recirculate in buildings with MERV 10 or below filters. A MERV 13 filter along with a UV system rated at UVR 13 may capture or sterilize 84% of airborne influenza viruses in just one pass.

Steven Welty LEED AP, CIE, CAFS Green Clean Air 703.927.7532

Adapted from "Modeling Immune Building Systems for Bioterrorism Defense" Journal of Architectural Engineering, June 2003

Toilet Aerosolization Studies

1959. Infective hazards of Water Closets. Lancet. "Any process involving the splashing or frothing produces droplets, which remain suspended in the air for a variable period depending upon the mass and evaporation-rate of the droplets, and the velocity and direction of the local air currents. Apart from explosive exhalations such as coughs and sneezes, the commonest process predisposing to the formation of infective aerosols must surely be the flushing of a water-closet."

1975. Microbial Hazards of Household toilets:Droplet Production and the Fate of Residual Organisms. Applied Microbiology. "it appeared that significant numbers of bacteria and viruses were being absorbed to the toilet porcelain and then eluted during the flushing action… virus from experiments performed several days earlier were still present in the room.

1985. Method of detecting Viruses in Aerosols. Recovered an average of 1500 airborne viruses due to a toilet flush.

2005. Transmission of Avian Influenza Viruses to and between Humans. Journal of Infectious Diseases. "The frequent occurrence of diarrhea and the detection of viral RNA in most fecal samples suggest that H5N1 virus may replicate in the human gastrointestinal tract and raise the question of whether human feces could be a source of transmission." See also:W.H.O.May 2005.

2005. The potential spread of infection caused by aerosol contamination of surfaces after flushing a domestic toilet. Journal of Applied Microbiology. "Aims: to determine the level of aerosol formation and fallout within a toilet cubicle after flushing a toilet contaminated with indicator organisms (viruses) at levels required to mimic pathogen shedding during infectious diarrhea." Airborne viruses were still aerosolized 30 minutes and 60 minutes after the first flush.

Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com

Airborne Droplet Nuclei Infection Studies

1966. Human Influenza form Aerosol inhalation. Proceeding of the Society Environmental Microbiological Medicine . Found that it took only .6 to 3 viruses to infect "volunteers" with aerosolized influenza. Contrast that with studies showing it took 80,000 to 180,000 viruses to infect someone nasopharyngeally.

1970. An Airborne Outbreak of Smallpox in a German Hospital and its Significance with Respect to other Recent Outbreaks in Europe. Bulletin of the World Health Organization. "In a recent outbreak..detailed epidemiological studies have clearly indicated that 17 of the cases were infected by virus particles disseminated by air over a considerable distance within a single hospital building…several features..were common similar to a similar outbreak in the Federal Republic of Germany in 1961 in which airborne transmission also occurred.

1975.Nosocomial Influenza Infection as a cause of Intercurrent Fevers in Infants. Pediatrics. " Six of seven shed the virus for 7 to 21 days."

1979. Indoor Spread of Respiratory Infection by Recirculation of Air. Bulletin of European Physiopathology Respiratory (Bulletin européen de physiopathologie respiratoire). One measles infected student went on to infect 28 others in classrooms throughout the school. "The wide distribution of the 28 cases among children who had never occupied the same room as the index patient and the fact that about 70 per cent of the air was recirculated (buildings today recirculate 20% or less) and hence shared by all the children served by the ventilating system, led to the conclusion that measles reached the different classrooms by way of the ventilating system. 93% of the first generation infections could have been prevented by disinfecting recirculated air. This would have aborted the entire outbreak. See also American Journal of Epidemiology Vol 7, No.5.

Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com

Airborne Droplet Nuclei Infection Studies

1979. An outbreak of Influenza aboard a commercial airliner. American Journal of Epidemiology. Of the 53 passengers on the plane, 38 (72%) became infected with the same strain of influenza as the sick passenger. "Spread of Influenza is via droplets or droplet nuclei and the period of infectivity of these particles is prolonged by low humidity."

1980. Airborne transmission of Chickenpox in a Hospital. New England Journal of Medicine. Chickenpox patient infected 13 other patients not only through indoor air but through her open window which, like Wang Kaixi, allowed air currents to blow her viruses downwind to infect others. "Her room was at positive pressure with respect to the hall and the outside of the building, these conditions promoted the escape of virus contaminated air. Once in the hall, air, presumably bearing droplet nuclei, was blown into the other rooms of the ward."

1985.Measles Outbreak in a Pediatric Practice. Pediatrics. "Airflow studies demonstrated the droplet nuclei generated in the examining room used by the index patient were dispersed throughout the entire office suite. (Large) droplet spread is unlikely because three of the patients with secondary cases were never in the same room as the source patient.

1998. Selected Viruses of Nosocomial Importance. Hospital Infection, 4th Edition. "Influenza A and B viral infections are among the moist communicable diseases of humans. Person to person transmission is believed to take place primarily by droplet nuclei. These aerosols help account for the explosive nature of influenza outbreaks, since, in a closed environment, one infected person can potentially infect large numbers of susceptible persons."

Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com

Airborne Droplet Nuclei Infection Studies

2004. Airborne Transmission of Communicable Infection-the Elusive pathway. "The current paradigm, as initially described by Charles Chapin in 1910, supports the belief the most communicable respiratory infections are transmitted by means of large droplets over short distances or through the contact with contaminated surfaces. What underlies the low repute of airborne transmission? First, the two diseases whose aerosol transmission is most widely acknowledged, measles and tuberculosis, have been largely controlled with vaccination or drug therapy. As a result, the impetus to understand the aerobiology of infectious diseases has faded. Second, contamination of water, surfaces and large droplet sprays can be easily detected. It is difficult, however, to detect the contaminated air, because infectious aerosols are usually extremely dilute, and it is hard to collect and culture fine particles. But the reduction of airborne transmission of influenza by means of air sanitation in school could prove important with the emergence of the next pandemic influenza virus.

2005. Viral Load Distribution in SARS Outbreak. Emerging Infectious Diseases. Showed how Amoy Garden victims of Wang Kaixi's SARS virus had higher levels of viruses in their nasal passages depending on how close they were to his apartment.

2006. Review of Aerosol transmission of Influenza Viruses. Emerging Infectious Diseases. "Large droplet transmission as the predominant mode by which influenza viruses is acquired. As a consequence of this opinion, protection against infectious aerosols is often ignored for influenza. This position contradicts the knowledge on influenza viruses transmission accumulated in the past several decades. Indeed, there relevant chapters of many reference books, written by recognized authorities, refer to aerosols (droplet nuclei) as an important mode of transmission for influenza. …human cases of avian influenza were acquired by exposure to an aerosol (droplet nuclei) since large droplets would not have delivered the virus to the lower respiratory tract."

Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com

Airborne Droplet Nuclei Infection Studies

2006. Disease Mitigation Measures in the Control of Pandemic Influenza. Biosecurity and Bioterrorism. "There are no data to demonstrate that hand-washing deters the spread of influenza within a community. General respiratory hygiene, such as covering one's mouth when coughing and using disposable paper tissues, is widely believed to be of some value in diminishing spread, even though there is no hard evidence that this is so. It has been recommended that individuals maintain a distance of 3 feet or more during a pandemic so as to diminish the number of contacts with people who are infected. The efficacy of this measure is unknown."

2006.Factors involved in the Aerosol transmission of infection and control of ventilation in healthcare facilities. Journal of hospital Infection Control. "Recent guidelines from the UK review the evidence for influenza transmission more comprehensively….influenza can become truly airborne. Droplets generated by talking, laughing and sneezing potentially lead to the generation of infectious aerosol (droplet nuclei). The survival of such aerosolized pathogens depends on environmental conditions such as temperature and relative humidity. Long range transmission occurs between distant location and is primarily governed by air flows driven by pressure differences generated by ventilation systems."

Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com

"Flu Season" due to Low Indoor Humidity

1960. Viruses survival as a seasonal factor in influenza and poliomyelitis. Nature.

1964. Survival of Measles in Air. Nature. "relative humidity indoors might be an important factor in the seasonal variation of measles (virus).

1976. Survival of airborne influenza virus: effects of propagating host, relative humidity and composition of spray fluids. Archives of Virology.

1979. An outbreak of Influenza aboard a commercial airliner. American Journal of Epidemiology. Of the 53 passengers on the plane 38 (72%) became infected with the same strain of influenza as the sick passenger. "Spread of Influenza is via droplets or droplet nuclei and the period of infectivity of these particles is prolonged by low humidity."

2006. Factors involved in the Aerosol transmission of infection and control of ventilation in healthcare facilities. Journal of Hospital Infection Control. "The survival of such aerosolized pathogens depends on environmental conditions such as temperature and relative humidity."

2007. Influenza Viruses Transmission is Dependent on relative Humidity and temperature. "Long term exposure to dry air is likely to affect influenza viruses growth in the upper respiratory tract, and may indeed play a role in influenza seasonality. (Influenza) transmission was highly efficient at low relative humidity levels-20% or 35% ."

Soma Medical Sdn Bhd - No. 92A, Lorong Maarof Bangsar Park 59000 Kuala Lumpur - Malaysia - South East Asia
Tel: +60 3 2287 5790 - Fax: +60 3 2287 6790 - Email: sales@somamedical.net - www.somamedical.net - www.somamedicalnews.com