

UVC purification – a key step towards COVID-safe venues?



DAVID BOON
General Management
Brussels Expo Group
(Belgium)

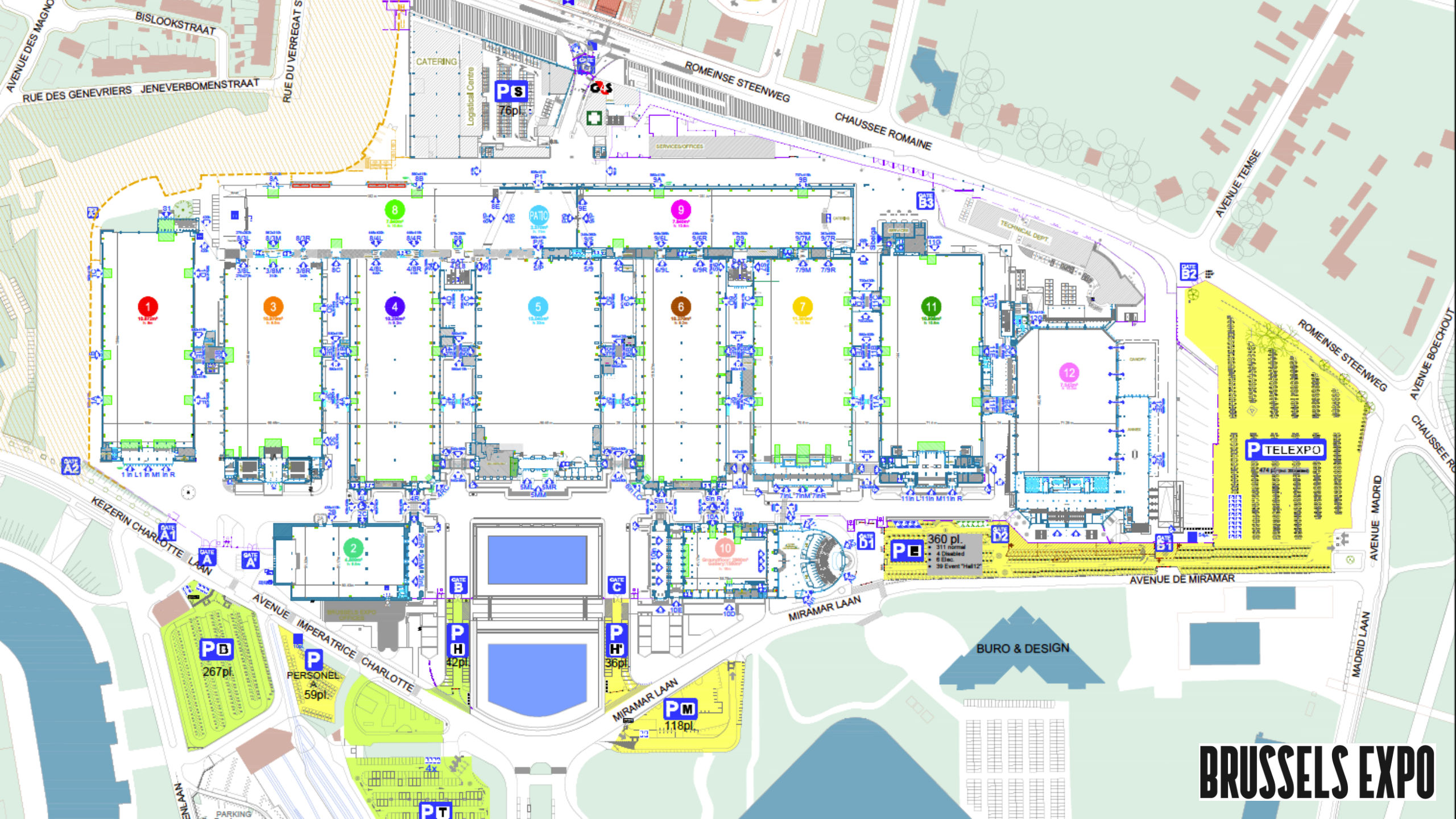


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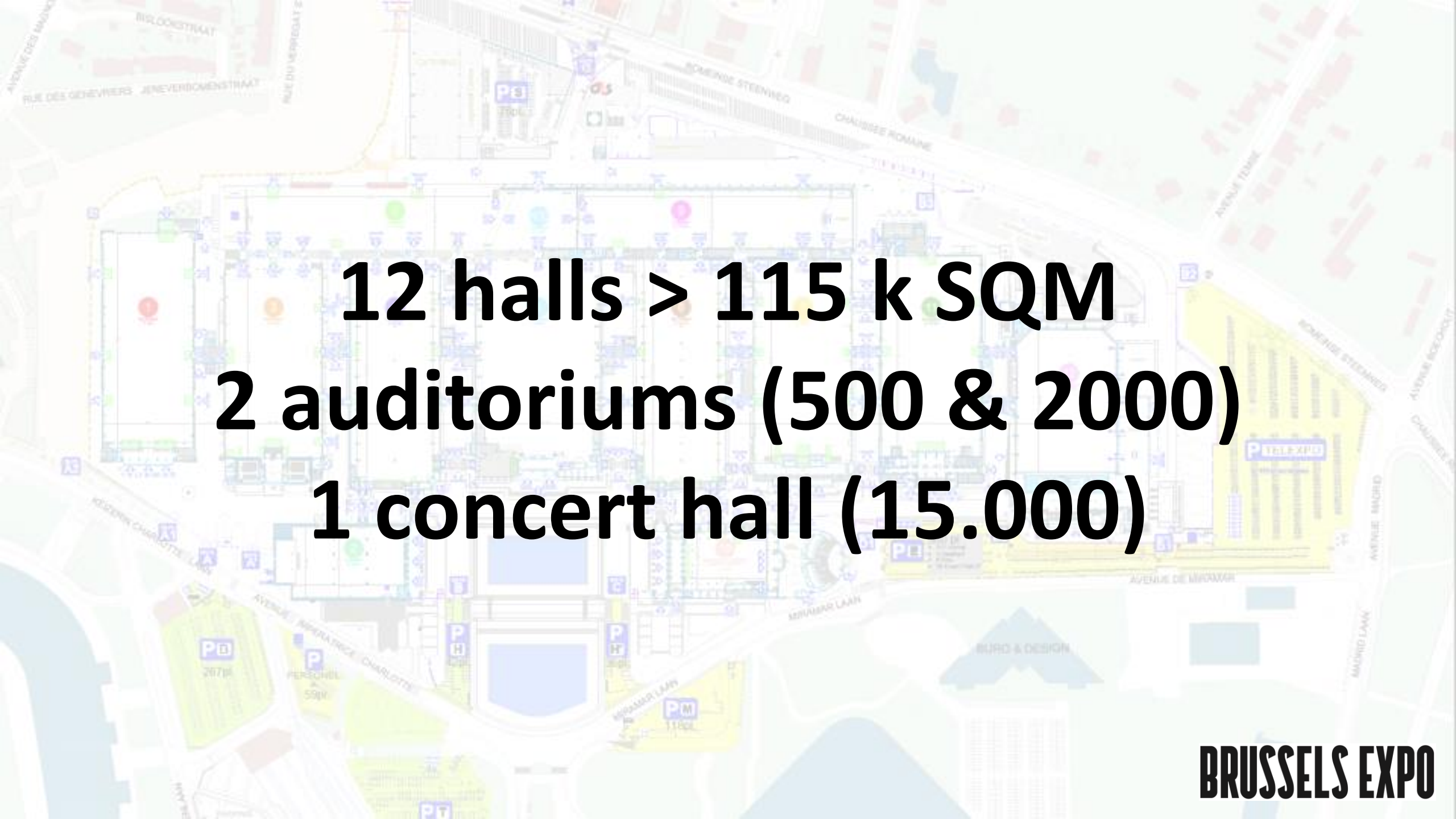
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FREEMAN



BRUSSELS EXPO

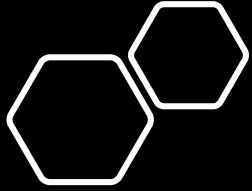
An aerial map of the Brussels Expo site, showing various buildings, parking areas, and streets. The map is overlaid with large, bold, black text. The text is centered on the map and lists the following information: 12 halls > 115 k SQM, 2 auditoriums (500 & 2000), and 1 concert hall (15.000). The map shows a complex layout of buildings and parking lots, with various streets and landmarks labeled. The text is positioned in the center of the map, overlaid on a large, light-colored rectangular area.

12 halls > 115 k SQM
2 auditoriums (500 & 2000)
1 concert hall (15.000)



MASTERPLAN 2020

BRUSSELS EXPO



Venue quality can be
defined by 3 main
categories

© jwc gmbh

BRUSSELS EXPO



EFFICIENCY

BRUSSELS EXPO



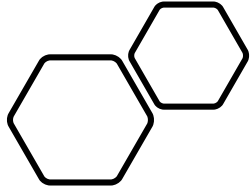
SERVICES
QUALITY

BRUSSELS EXPO



SAFETY

BRUSSELS EXPO



Offering a safe venue must be the top priority



Total Confirmed

4 067 112

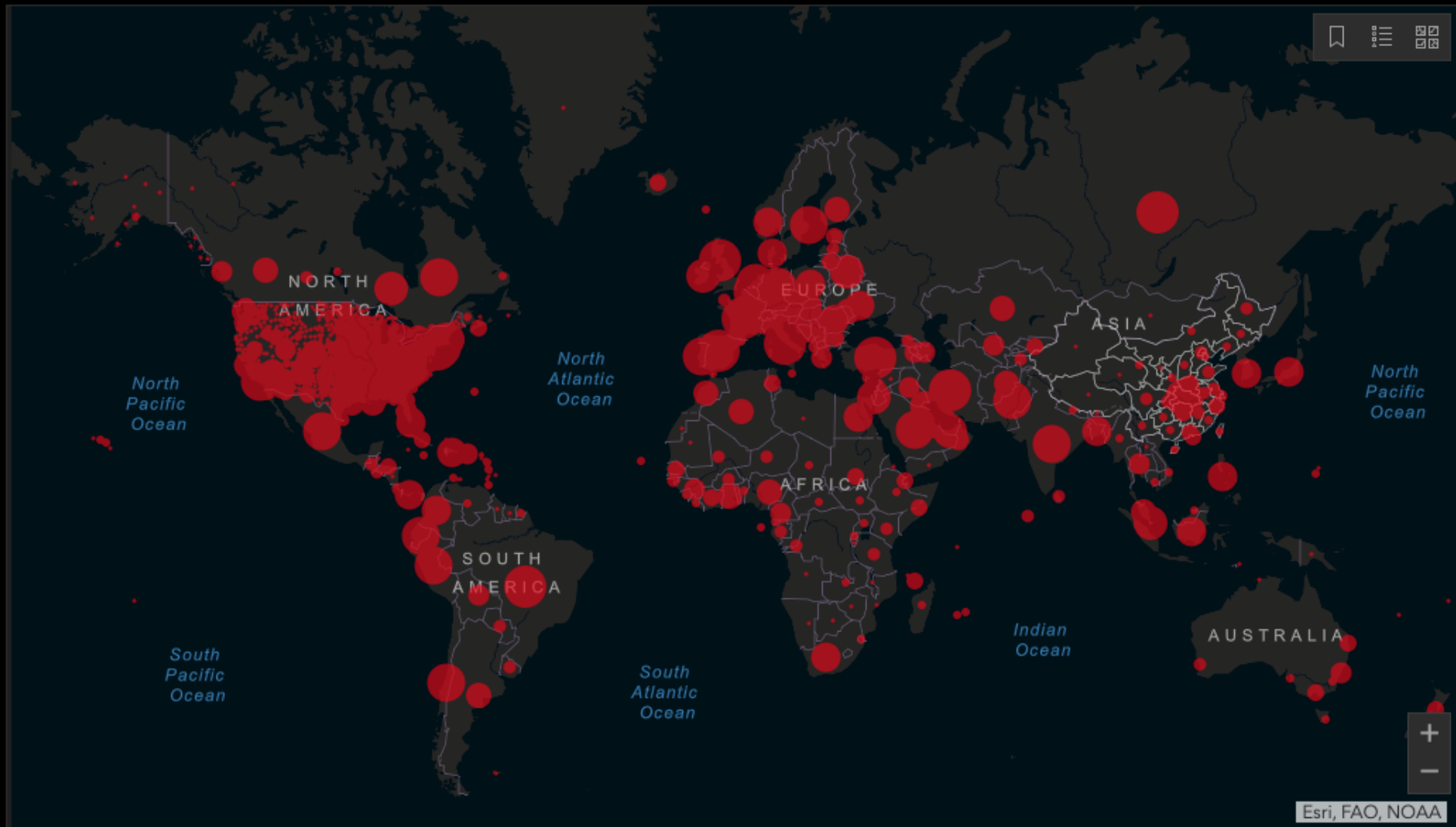
Confirmed Cases by
Country/Region/Sovereignty

- 1 314 799 US
- 223 578 Spain
- 220 449 United Kingdom
- 219 070 Italy
- 209 688 Russia
- 176 782 France
- 171 639 Germany
- 156 604 Brazil
- 138 657 Turkey
- 107 603 Iran
- 83 994 China
- 68 952 Canada
- 65 021 India
- 65 015 Peru

Admin0 Admin1 Admin2

Last Updated at (M/D/YYYY)

5/10/2020 6:32:30 PM



Esri, FAO, NOAA

Cumulative Confirmed Cases

Active Cases

Incidence Rate

Case-Fatality Ratio

Testing Rate

Hospitalization Rate

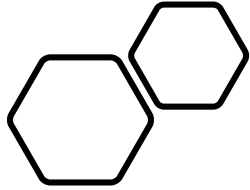
187

countries/regions

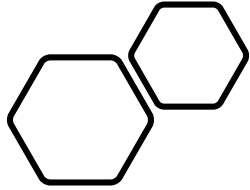
Lancet Inf Dis Article: [Here](#). Mobile Version: [Here](#).

Lead by [JHU CSSE](#). Automation Support: [Esri Living Atlas team](#) and [JHU APL](#). [Contact US](#). [FAQ](#).

Data sources: [WHO](#), [CDC](#), [ECDC](#), [NHC](#), [DXY](#), [1point3acres](#), [Worldometers.info](#), [BNO](#), [the COVID Tracking Project](#) (testing and



Offering a safe venue ~~must be the~~ top priority



Offering a safe venue **is our** top priority

Internal Audit approach

Risk assessment

-


Internal Controls

=

Residual risk

Risk : spread of infections <u>Mode of transmission</u>	Risk classification	Risk classification score	Venue impact score	Type of controls and objectives			Confidence / UX score	Durability bonus	Total score	Priority ranking
				Preventive	Detective	Corrective				
Direct contact (1)	+++	3	(1 to 5)	3	2	1	(1 to 5)	(0 or 1)		
Indirect contact with surfaces or object (2)	++	2								
Airborne (3)	+	1								
<u>Protocol (top 20)</u>										
Ticketing time slot	(1)	3	3	✓			3	1	13	4
Thermal camera	(1)	3	4		✓		3	1	13	4
Air purifier devices (UVC + Ions + Plasma)	(2)+(3)	3	5	✓			5	1	17	1
Surface cleaning	(2)	2	3	✓			5	0	13	4
PPE (personal protective equipment)	(1)+(3)	4	3	✓			5	0	15	2
Physical distancing floor signage	(1)	3	2	✓			5	0	13	4
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Recommandations	(1)	1	3	✓			4	0	11	13
Objects disinfection before entry	(2)	2	3	✓			2	0	10	16
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Adapt event formats	(1)	3	1	✓			3	0	10	16
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Isolate person with symptoms	(1)	3	3			✓	1	0	8	19

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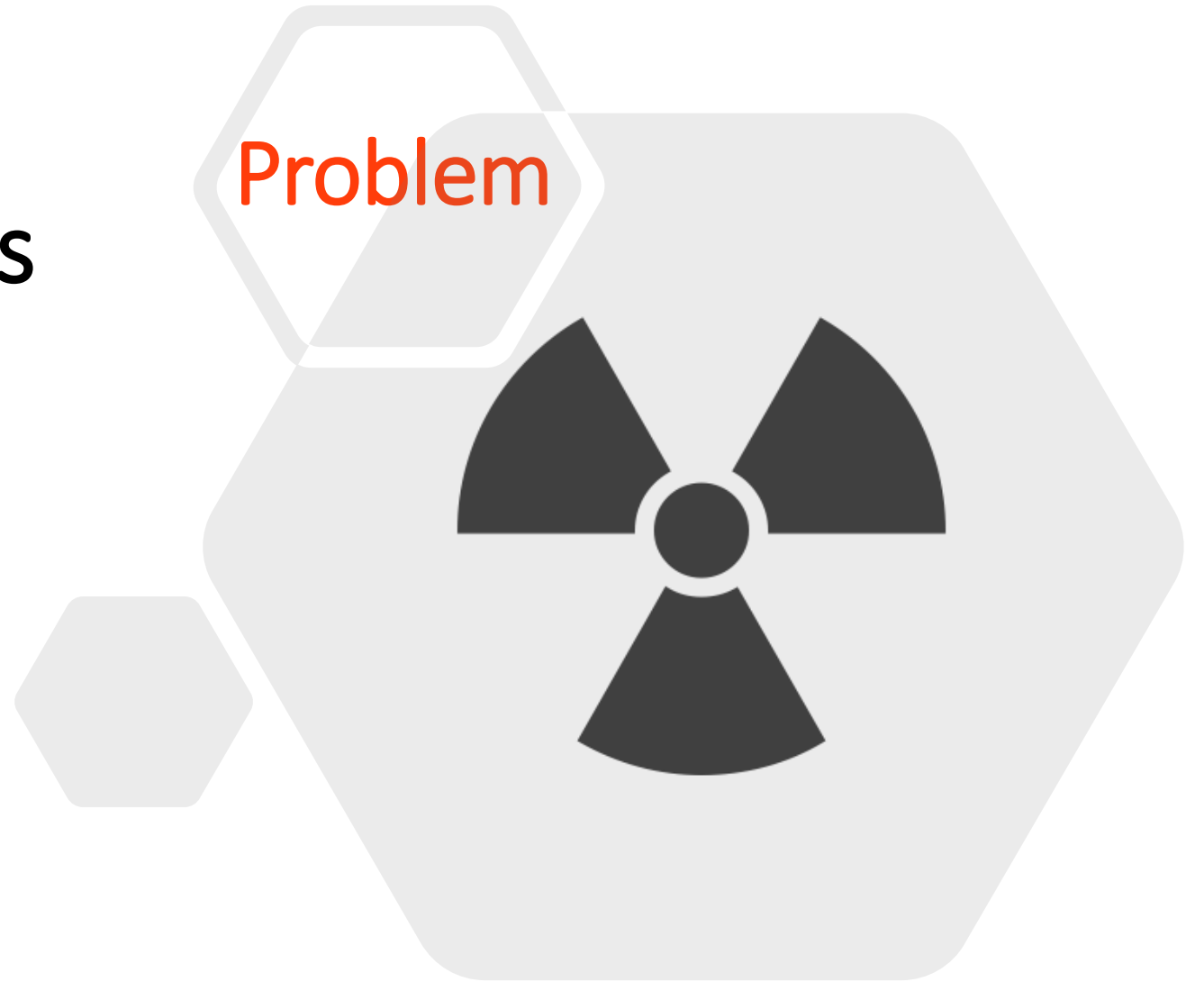
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Isolate person with symptoms	(1)	3	3			✓	1	0	8	19

Risk : Infection	Risk classification	Risk classification score	Venue impact score	Type of controls and objectives			Confidence / UX score	Durability bonus	Total score	Priority ranking
				Preventive	Detective	Corrective				
Mode of transmission										
Direct contact (1)	+++	3	(1 to 5)	3	2	1	(1 to 5)	(0 or 1)		
Indirect contact with surfaces or object (2)	++	2								
Airborne (3)	+	1								
Protocol (top 20)										
Ticketing time-slot	(1)	3	3	✓			3	1	13	4
Thermal camera	(1)	3	4		✓		3	1	13	4
Air purifier devices (UVC + Ions + Plasma)	(2)+(3)	3	5	✓			5	1	17	1
Surface cleaning	(2)	2	3	✓			5	0	13	↑ ↓
PPE (personal protective equipment)	(1)+(3)	4	3	✓			5	0	15	
Physical distancing floor signage	(1)	3	2	✓			5	0	13	
One-way circulation	(1)	3	1	✓			2	0	9	
Food safety	(2)	2	5	✓			3	0	13	
Temperature checks	(1)	3	3		✓		5	0	13	
Electrostatic disinfection	(2)	2	3	✓			5	0	12	
Hand sanitizers	(1)+(2)	5	4	✓			3	0	15	
Reduced touchpoints	(2)	2	3	✓			3	1	12	
Contactless transactions	(2)	2	4	✓			3	1	13	
Informations signage	(1)	1	3	✓			4	0	11	
Recommandations	(1)	1	3	✓			4	0	11	
Objects disinfection before entry	(2)	2	3	✓			2	0	10	
Limit audience per sqm	(1)	3	2	✓			3	0	11	
Adapt event formats	(1)	3	1	✓			3	0	10	
Traceability through Data	NA	0	3			✓	1	1	6	20
Isolate person with symptoms	(1)	3	3			✓	1	0	8	19

1. Spread of infections

- Direct contact
- Indirect contact
- Airborne

2. Confidence (residual risk)



Risk assessment

-

Internal Controls (> reopen)

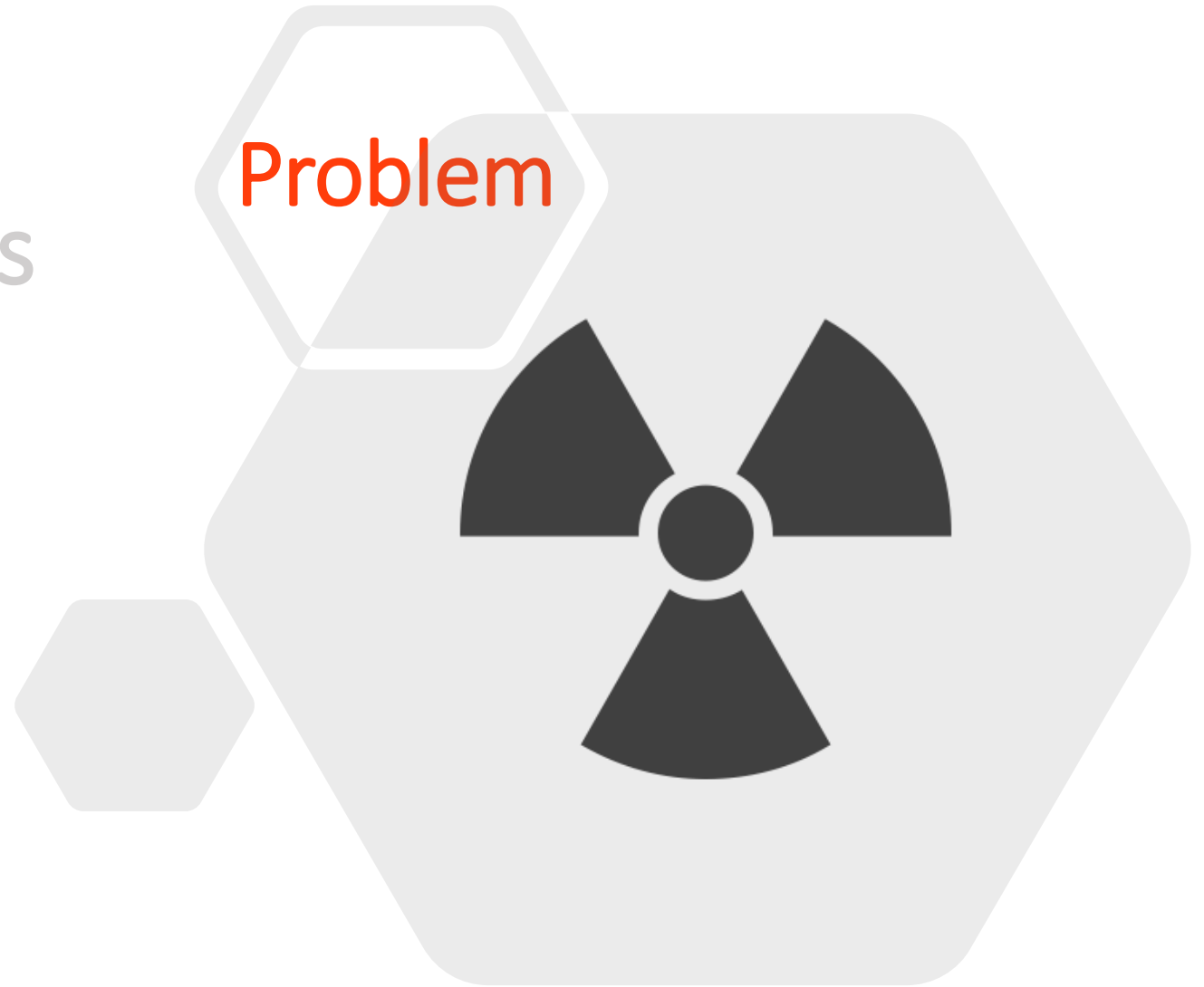
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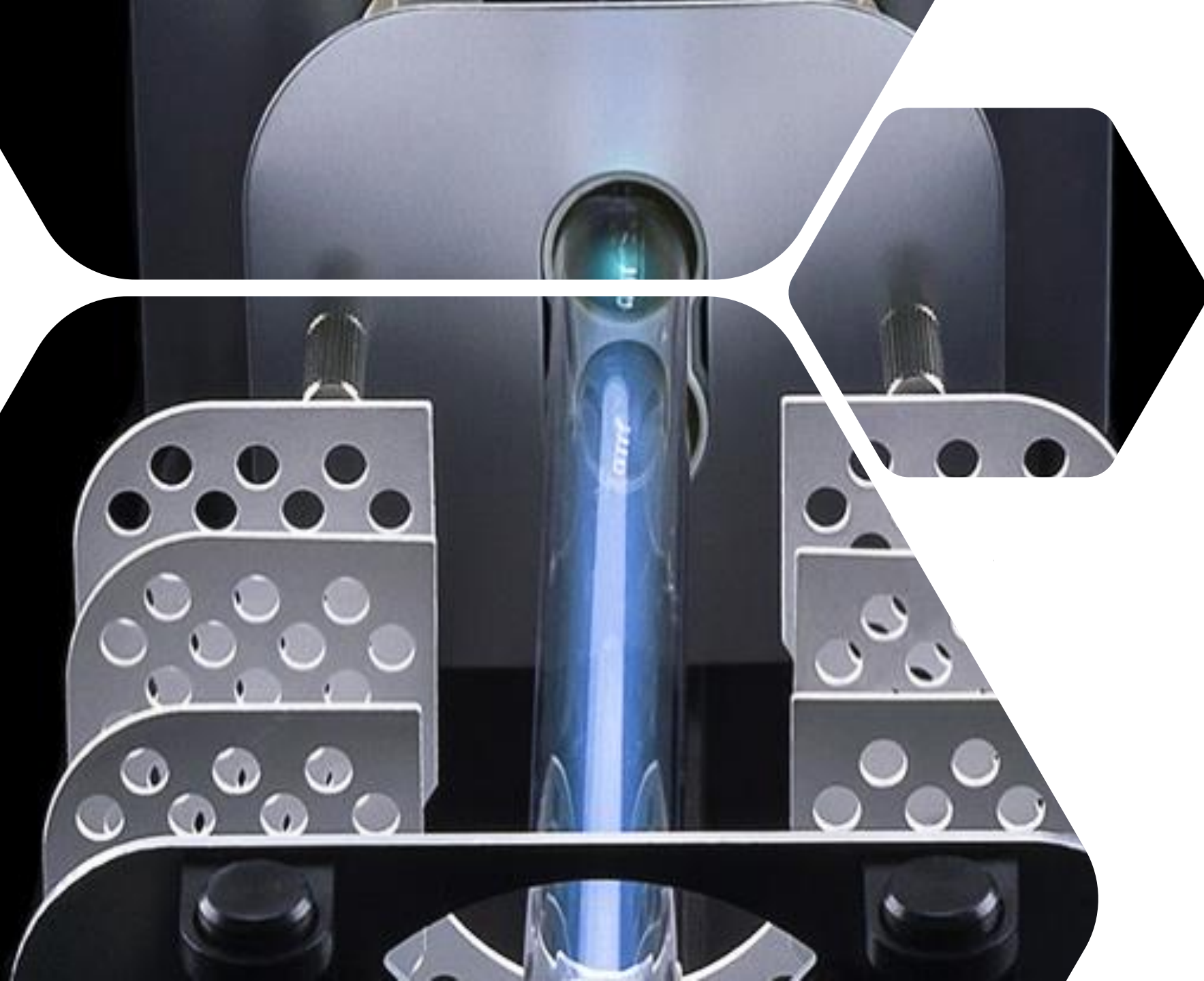
Residual risk (> do not come)

1. Spread of infections

- Direct contact
- Indirect contact
- Airborne

2. Confidence (residual risk)





SOLUTION



UZA

ANVERS

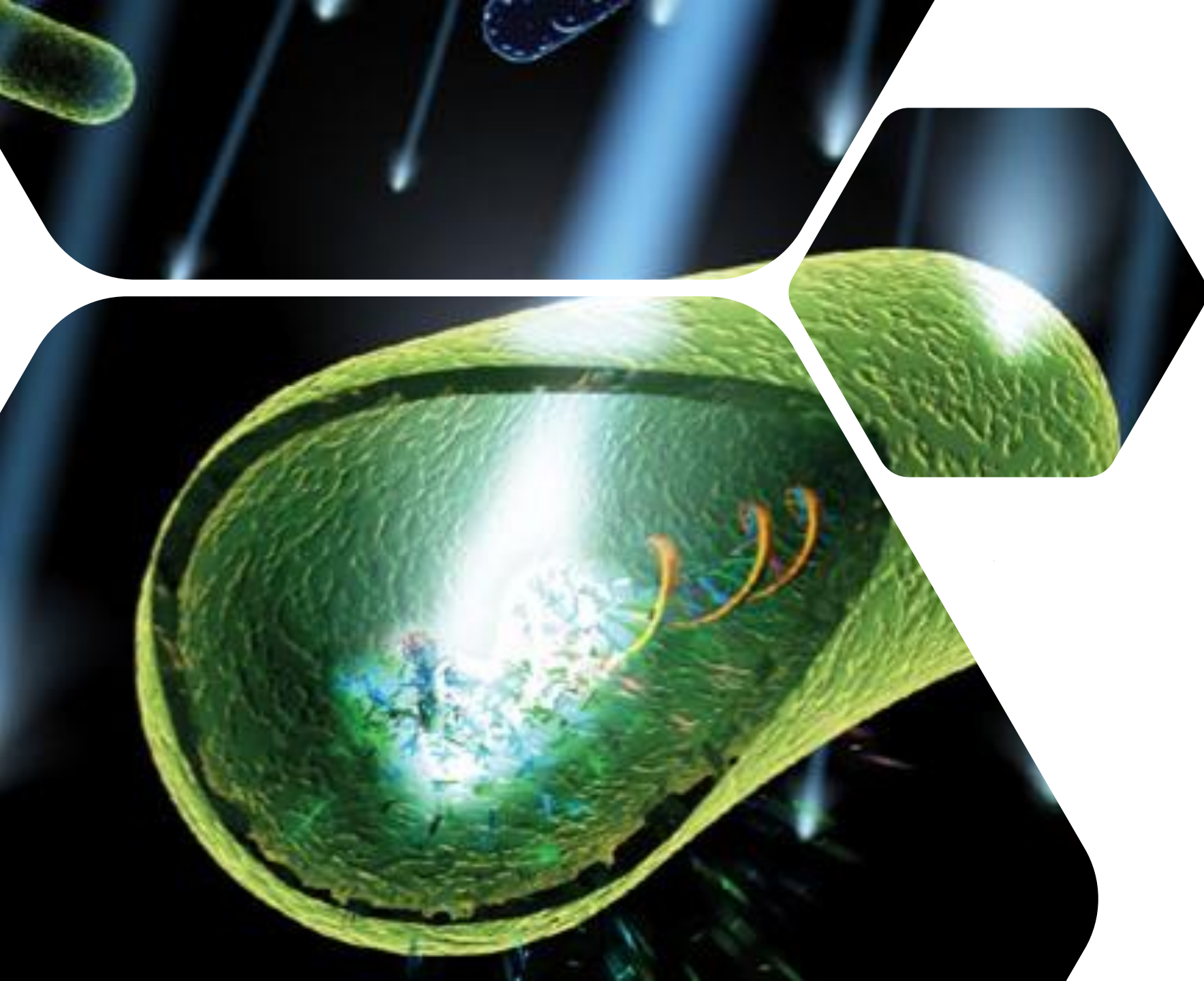


CHU ST-PIERRE

BRUXELLES

LA CONTAGION PROGRESSE EN EUROPE

BRUSSELS EXPO

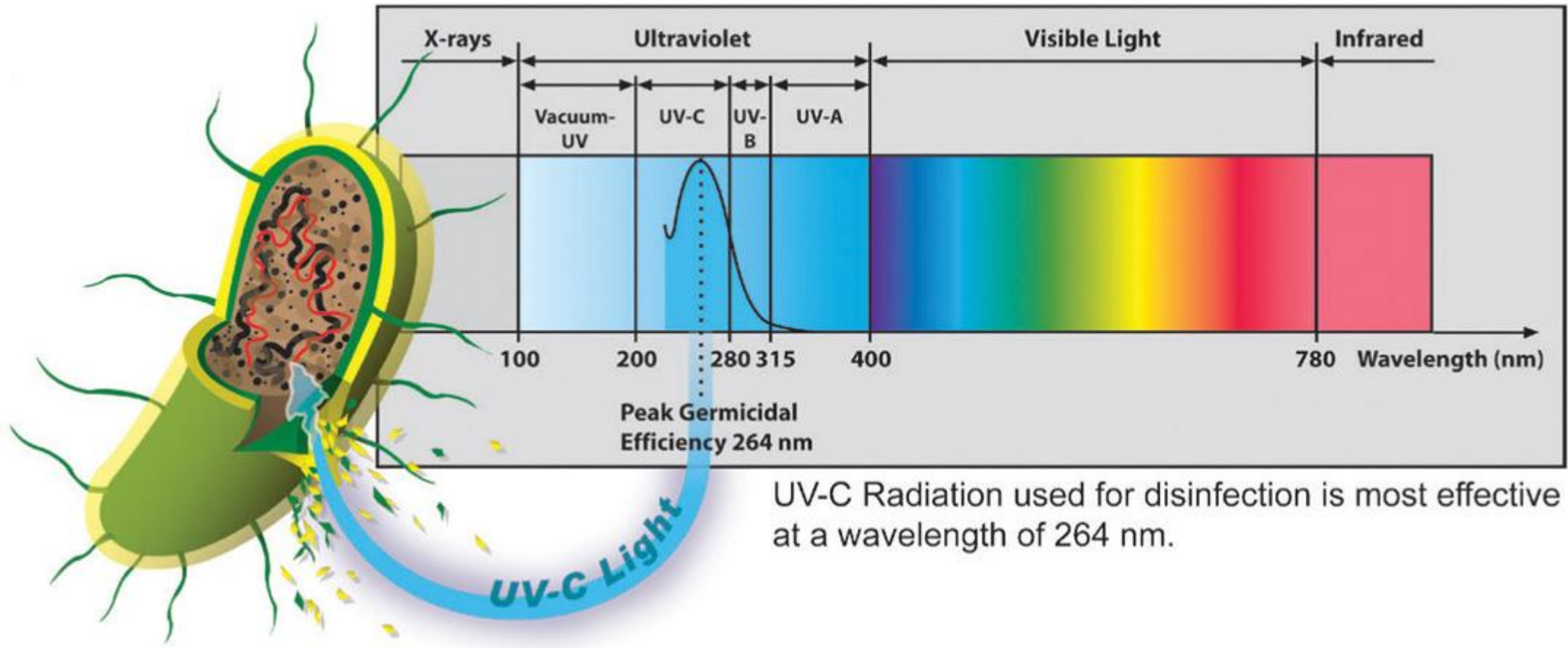


UV-C
PCO
OZONE
IONS -

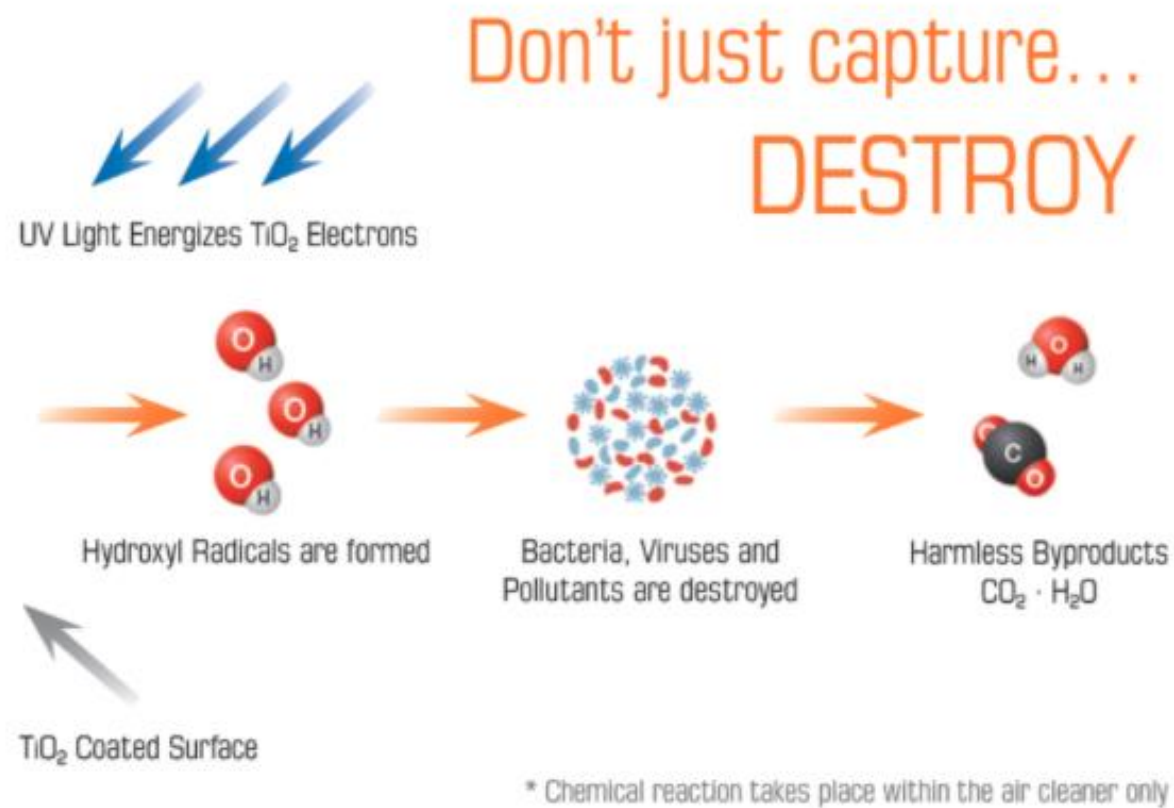
BRUSSELS EXPO

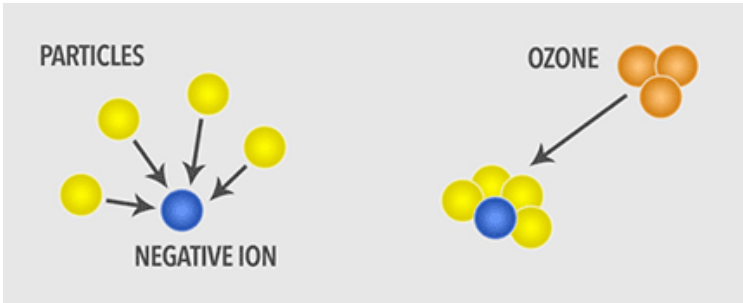
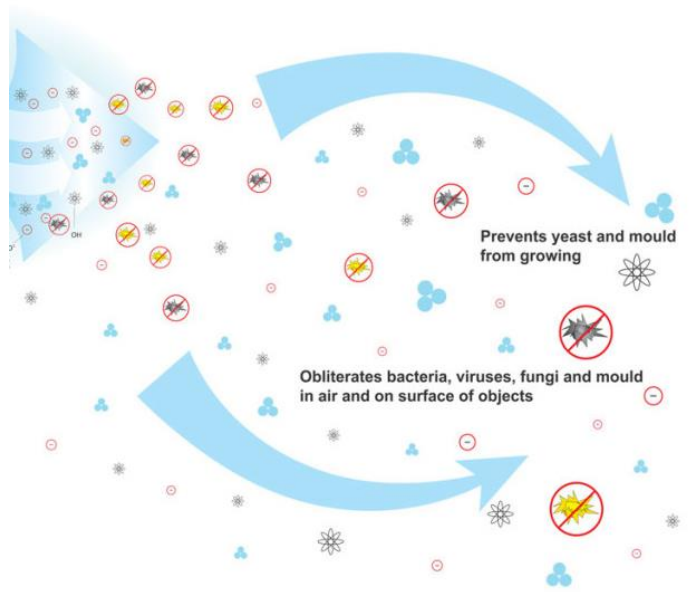
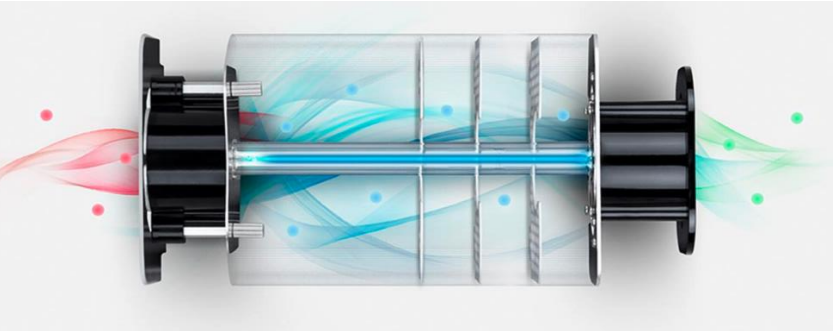


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UV-C Radiation used for disinfection is most effective at a wavelength of 264 nm.





STUDIES

Virus		
B40-8 phage	Echovirus I	PHI X 174 phage
H5N1 (Influenza A)	Echovirus II	Poliovirus type 1
hPIV-3 (Parainfluenza virus)	Echovirus 29	Poliovirus type Mahoney
Adenovirus type 2	Encephalomyocarditis virus	PRD-1 phage
Adenovirus type 15	Enteric virus	Reovirus type 1
Adenovirus type 40	Enterovirus	Reovirus type 3
Adenovirus type 41	GDVII	Rhabdovirus
Calicivirus canine	Hepatitis A	Rotavirus SA-11
Calicivirus feline	Herpes Virus	Stomatitis
Coxsackievirus A9	HIV	Tobacco mosaic
Coxsackievirus B3	Influenza Virus	Variola virus (smallpox)
Coxsackievirus B5	MS2 phage	Vesicular virus

Destroys
99.9998%
of H5N1

Source : CNRS

Table 1. Results of Aerosol study

Micro-organism	Percentage Efficiency		
	Run 1	Run 2	Run 3
MS-2 coliphage	87.18%	92.17%	89.04%
<i>Staph. epidermidis</i>	98.11%	97.69%	97.94%

Table 2. Results of Surface decontamination study

Test Number	Micro-organism			
	MS-2 coliphage		MRSA	
	% Efficiency	Log Reduction	% Efficiency	Log Reduction
Test Disc 1	39.69	0.22	32.10	0.17
Test Disc 2	59.47	0.39	45.24	0.26
Test Disc 3	21.46	0.10	51.81	0.32
Test Disc 4	15.85	0.07	44.14	0.25
Test Disc 5	no effect	No effect	1.42	0.006

Source : Health Protection Agency



Cold oxygen plasma technology efficiency against different airborne respiratory viruses

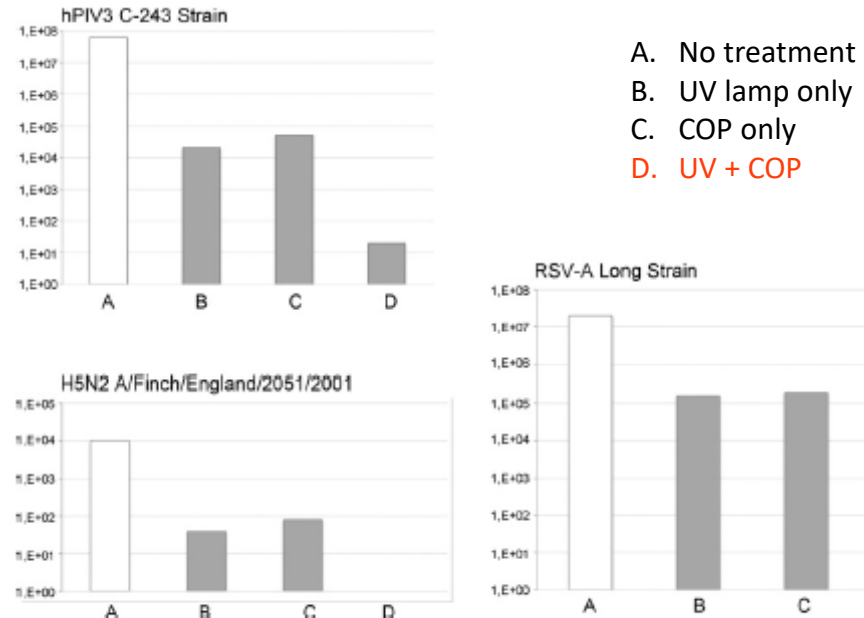


Fig. 3. Determination of downstream outlet infectious titers in different conditions for hPIV-3, RSV and A (H5N2) influenza.

STUDIES TO COME



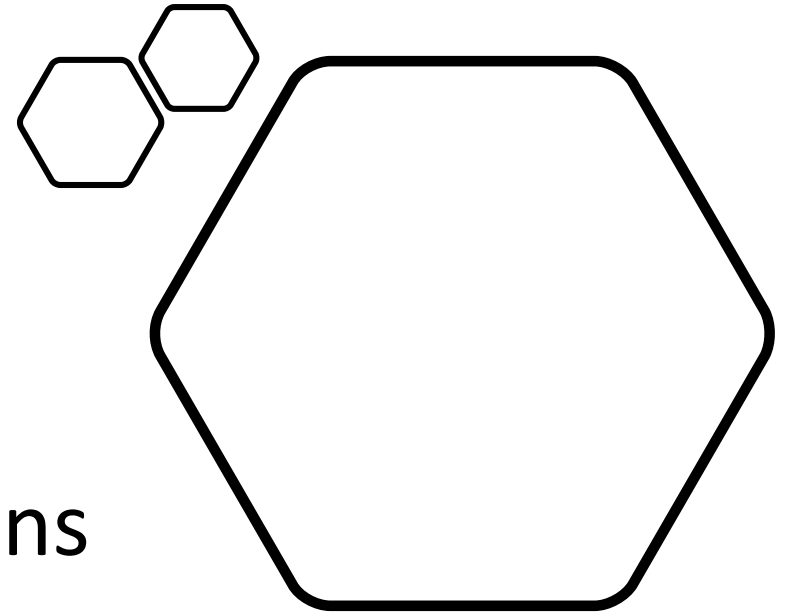
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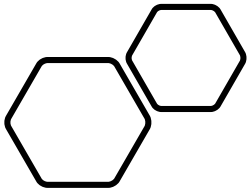
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BRUSSELS EXPO

RISK REDUCTION

- **Indirect contact**
> surfaces & object contaminations
- **Airborne**





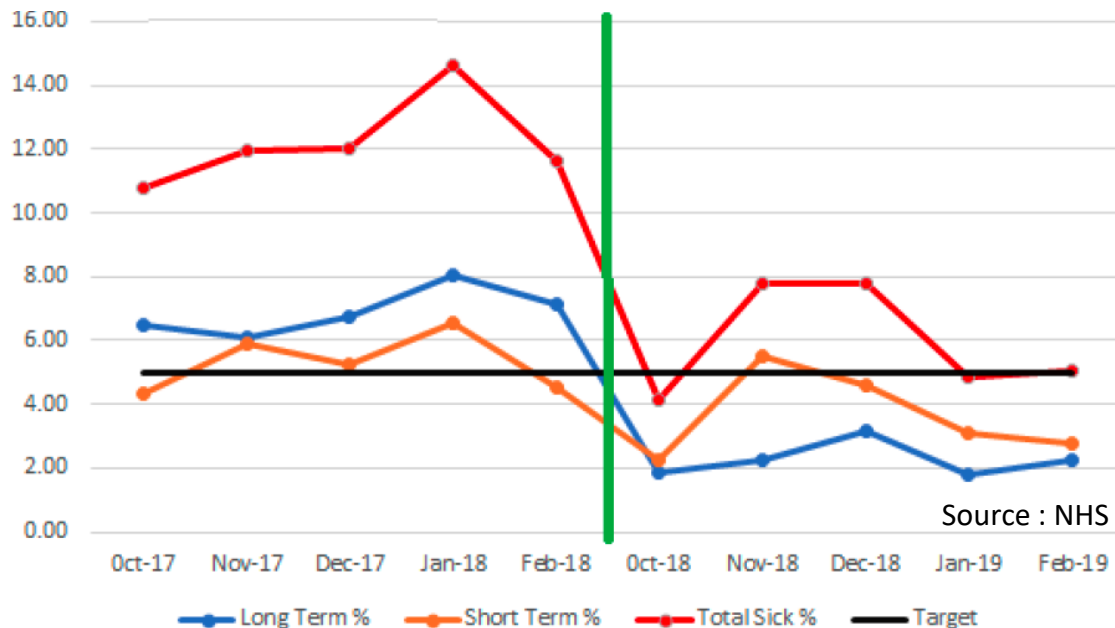
The NEW ENGLAND
JOURNAL of MEDICINE

https://www.nejm.org/doi/full/10.1056/NEJMc2004973?query=featured_home

- > Viable SARS-cov2 up to 3 hours post aerosolization
- > Aerosol and Surface stability of SARS-cov1 & SARS-cov2 are comparable
- > Airborne transmission may have been responsible for the largest 53 superspreading event during the SARS epidemic of 02-03

REFERENCES

England Ambulance Service : absenteeism



Reduction of 54% of total sickness

Offices : banking sector

Waste management : recycling centers

Stadium : Premierleague

Travel : Airports

Public transport : London

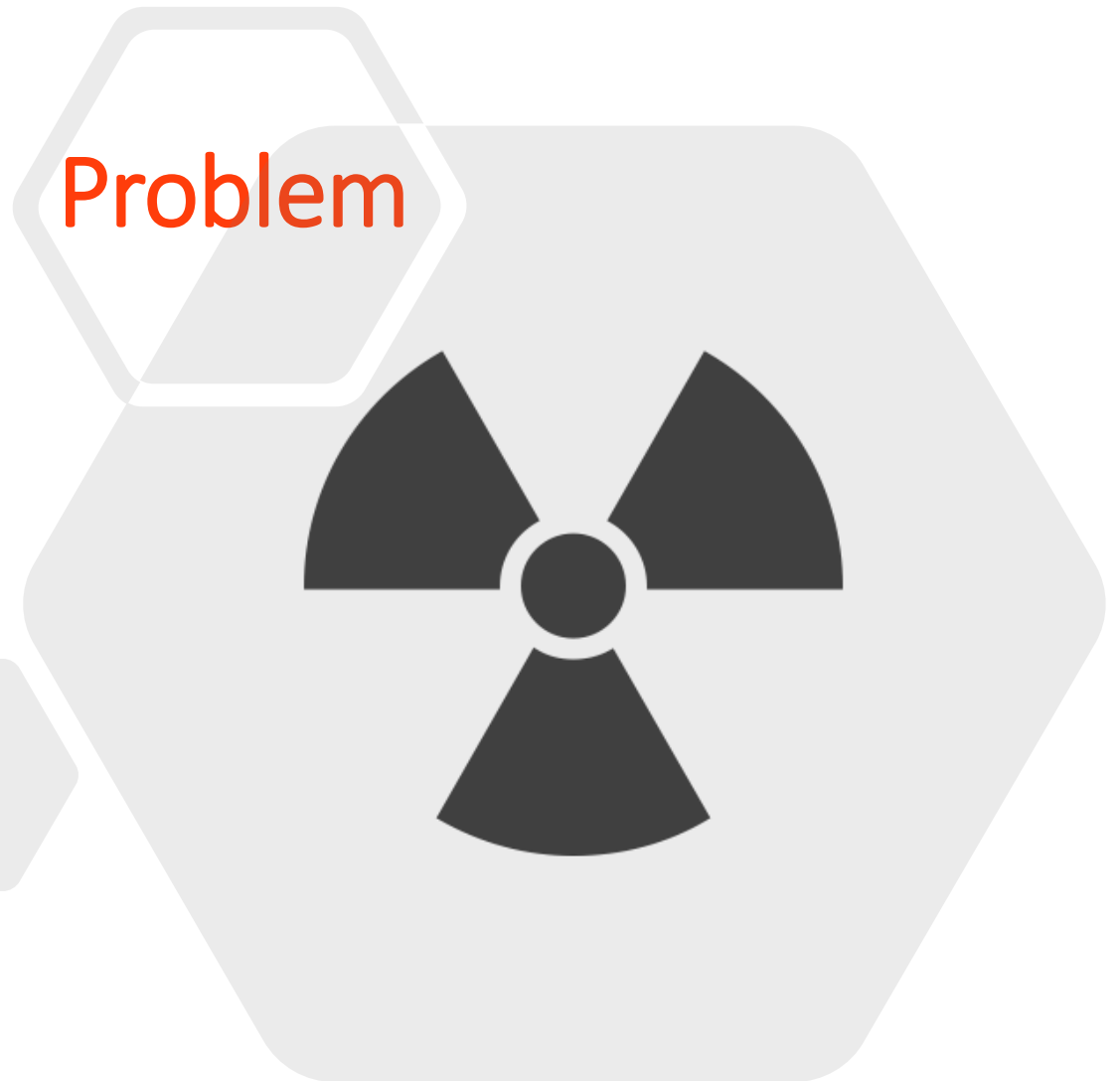
Medical : dentists, hospitals,...

Covid-19 : Wuhan hospital

1. Spread of infections

- Direct contact
- Indirect contact
- Airborne

2. Confidence (bring customers back)



CONFIDENCE

Poll

- 27% attend of course !
- **31% only if**
- 34% when vaccine is found
- 8% won't

Source : Brussels Expo survey on B2C DB - 16.000 answers received

AIR QUALITY

- Difficulty breathing
- Invisible ennemy
- Link air pollution

CONFIDENCE

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AIR QUALITY

- **Difficulty breathing**
- **Invisible ennemy**
- **Link air pollution**

AIR
vs WATER
vs FOOD



The average adult inhales and exhales 11,000 liters of air/day



90% indoor



Air quality standards to be reviewed

COMMERCIAL FEEDBACKS



EU event not cancelled



B2C show 1Q2021 could start selling



New prospects

CONCLUSIONS

SAFE VENUE OUR TOP PRIORITY

QUALITY OF INDOOR AIR

PART OF A PROTOCOL

RISKS MANAGEMENT + CONFIDENCE

LITERATURES

The New York Times

May 7, 2020

Scientists Consider Indoor Ultraviolet Light to Zap Coronavirus in the Air

Some researchers hope a decades-old technology might get its moment and be deployed in stores, restaurants and schools.

<https://www.nytimes.com/2020/05/07/science/ultraviolet-light-coronavirus.html>

COLUMBIA UNIVERSITY IN THE CITY OF NEW YORK

COLUMBIA NEWS

Could a New Ultraviolet Technology Fight the Spread of Coronavirus?

Columbia researcher David Brenner believes far-UVC light—safe for humans, but lethal for viruses—could be a ‘game changer.’

By Carla Cantor
April 21, 2020

<https://news.columbia.edu/ultraviolet-technology-virus-covid-19-UV-light>

BRUSSELS EXPO