

**INTERVENÇÕES TECNOLÓGICAS
PARA MITIGAR A
TRANSMISSÃO AÉREA DE PATÓGENOS
EM AMBIENTES INTERNOS**

Self-Determination Theory

Human beings have three basic needs:

Competence

People need to gain mastery and control of their own lives & their environment.

Essential to wellness

Autonomy

People need to feel in control of their own life, behaviours and goals. This is about choice.

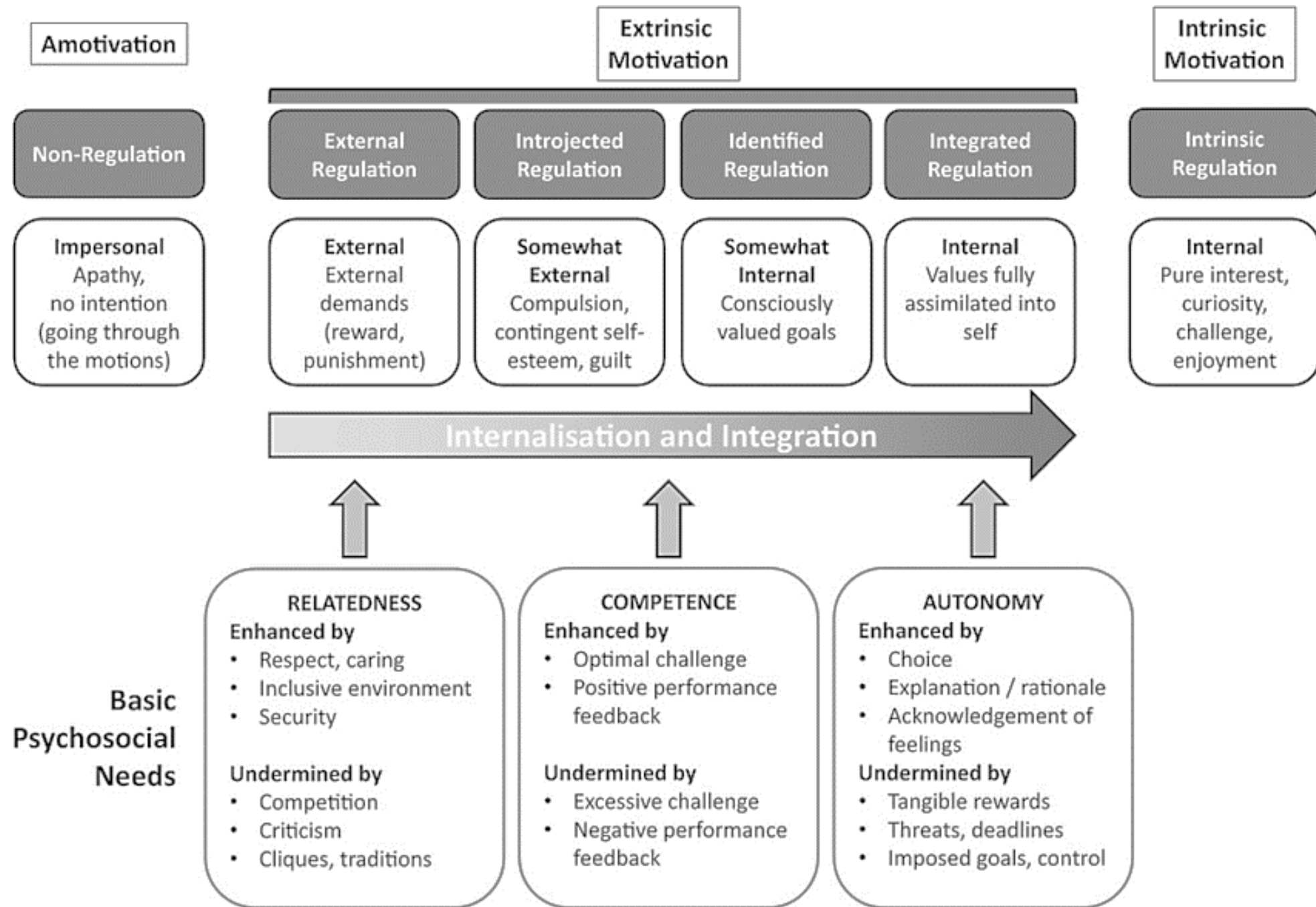
Relatedness

People need to experience a sense of belonging and connection with other people.

Feeling cared for by others & to care for others.





Based on the work of Richard Ryan and Edward Deci.

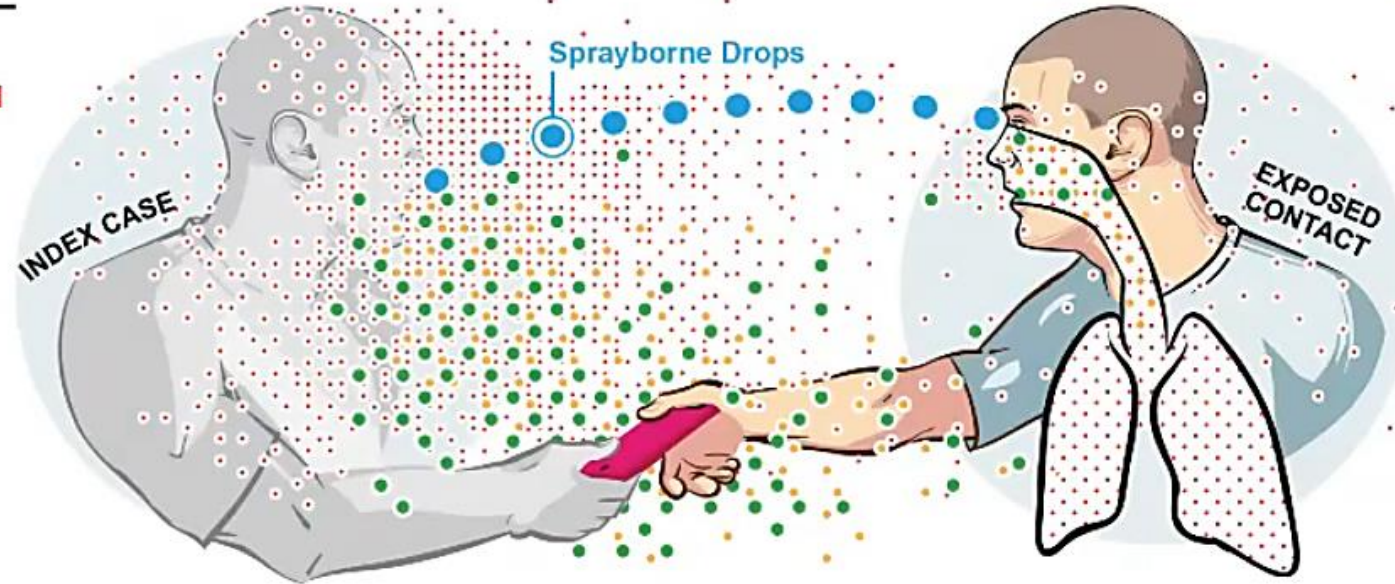


Transmission Modes of Respiratory Virus



Key _____

-  **Respirable Aerosol**
 $\leq 5\mu\text{m}$
-  **Thoracic Aerosol**
 $\leq 10\mu\text{m}$
-  **Nasopharyngeal Aerosol**
 $\leq 100\mu\text{m}$
-  **Fomite**

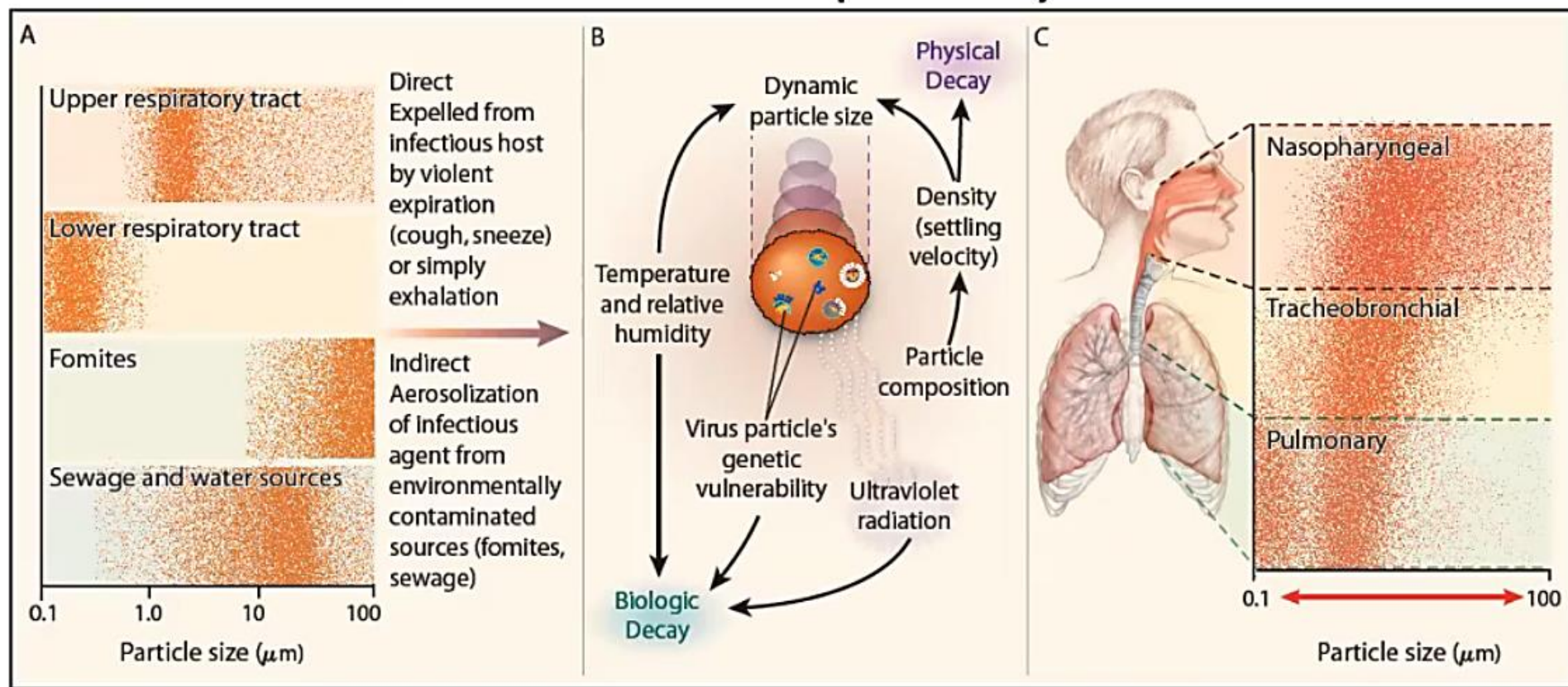


- **Contact**
 - Patient to finger
 - Fomite to finger transfer
 - Finger to eye, nose, or mouth transfer
- **Splash and Spray**
 - Ballistic drops ($> 100\mu\text{m}$)
 - Direct hit on eye, nostril, or mouth
- **Inhalation**
 - Inhalable aerosols $\leq 100\mu\text{m}$
 - Thoracic aerosols $\leq 10\text{-}15\mu\text{m}$
 - Respirable aerosols $\leq 5\mu\text{m}$



The Elusive Pathway

The Aerobiological Pathway for Transmission of Communicable Respiratory Disease



A: Source, B: Transport and Dispersion, C: Deposition



Viruses that infect the upper respiratory tract

Sinusitis
Pharyngitis



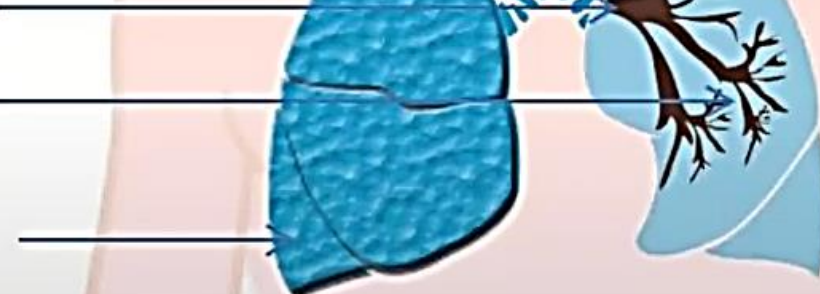
Otitis media

- Rhinovirus
- Coronavirus
- Influenza virus
- Parainfluenza virus
- Respiratory Syncytial virus
- Herpesvirus
- Adenovirus
- Bocavirus
- Coxsackivirus

Bronchitis

Bronchiolitis

Pneumonia

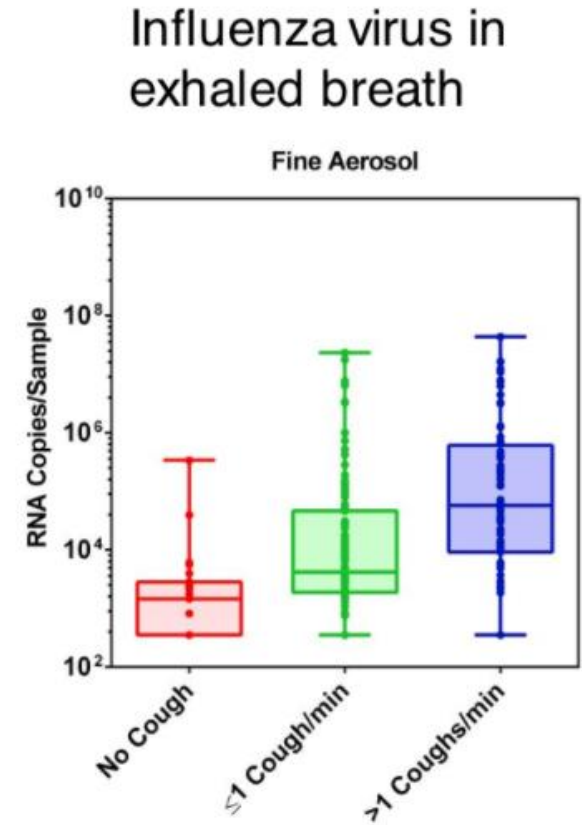
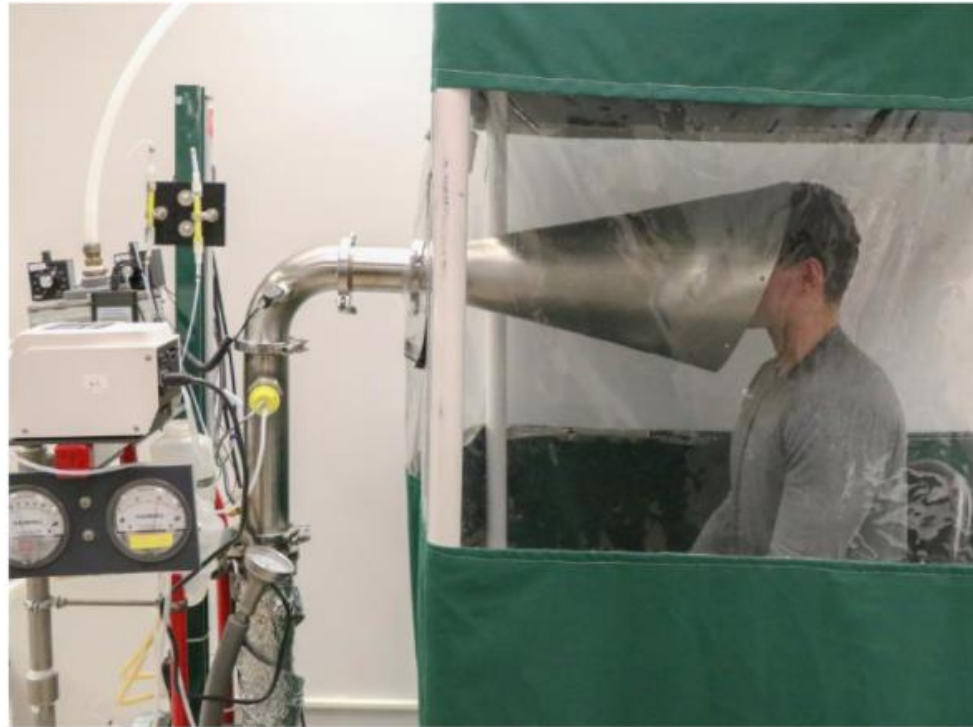


Viruses that infect the lower respiratory tract

- Influenza virus
- Parainfluenza virus
- Respiratory Syncytial virus
- Adenovirus
- Bocavirus
- Metapneumovirus

Gesundheit-II Human Bioaerosol Collector

- Coarse aerosol (> 5 and $< 80 \mu\text{m}$)
- Fine aerosol ($> 0.05 \mu\text{m}$ and $\leq 5 \mu\text{m}$)
- **Influenza virus was cultured from fine aerosol ($\sim 1/\text{min}$)**
- **Influenza virus is present in exhaled breath – even without coughing.**



COLD
5°c

WARM
35°c

COOL
12°c



CONDITIONER

INITIATOR

MODERATOR

THREE STAGE

HIGH EFFICIENCY 5 nm - 10 μ m
MINIMAL HEATING
MAINTAINS MICROBIAL VIABILITY
PRESERVES GENOMIC INTEGRITY

Infectious SARS-CoV-2 in Exhaled Aerosols and Efficacy of Masks During Early Mild Infection

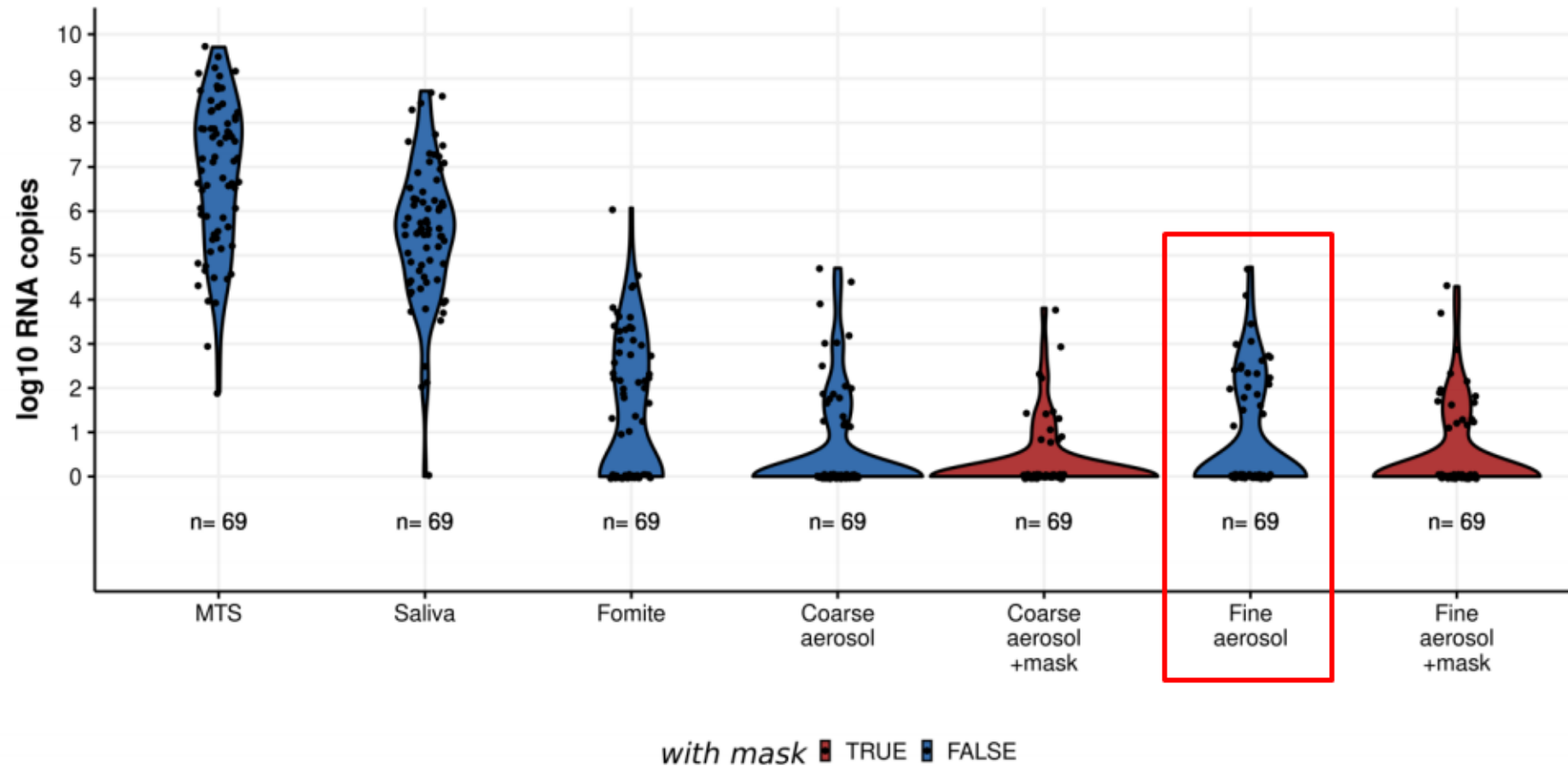


Figure 1. Viral RNA shedding in paired with and without face mask samples. Viral RNA measured during 69 same-day paired sampling events with and without mask from 46 seronegative cases. Samples with no detected viral RNA were assigned a copy number value of one. Exhaled breath aerosols were obtained in 30-minute sampling durations. “+mask” = sample collected while wearing a face mask. MTS = mid-turbinate swab, Fomite = swab of participant’s mobile phone.

Sugestão de Avaliação do Risco Ocupacional

COVID-19 Risk Calculator

Gain an understanding of how to reduce the risk of COVID-19 transmission in indoor environments using affordable control strategies.



HARVARD T.H. CHAN
SCHOOL OF PUBLIC HEALTH



<https://bit.ly/atr-estimator>

<https://covid-19.forhealth.org/covid-19-transmission-calculator/>

1. ROOMS & PEOPLE

Basic Advanced

Room Size 50 m²

Metric English



Small Large

Hide factors ^

The floor area of the room.

50 m²

The height of the room.

3.5 m

Time Spent in Room 6 hour(s)



1 hour 10 hours

Show factors v

Activity Type

Sitting/resting ?

Light activity ?

Moderate activity ?

Intense activity ?

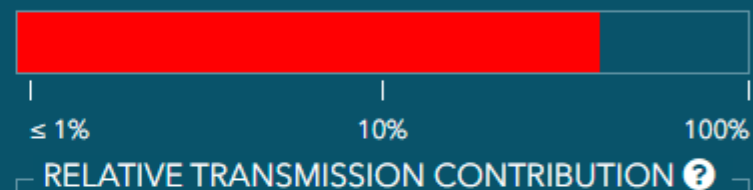
I don't know

Show factors v

RESULTS

The scenario data you've entered result in the following risk profile:

39% ESTIMATED TRANSMISSION RISK ?



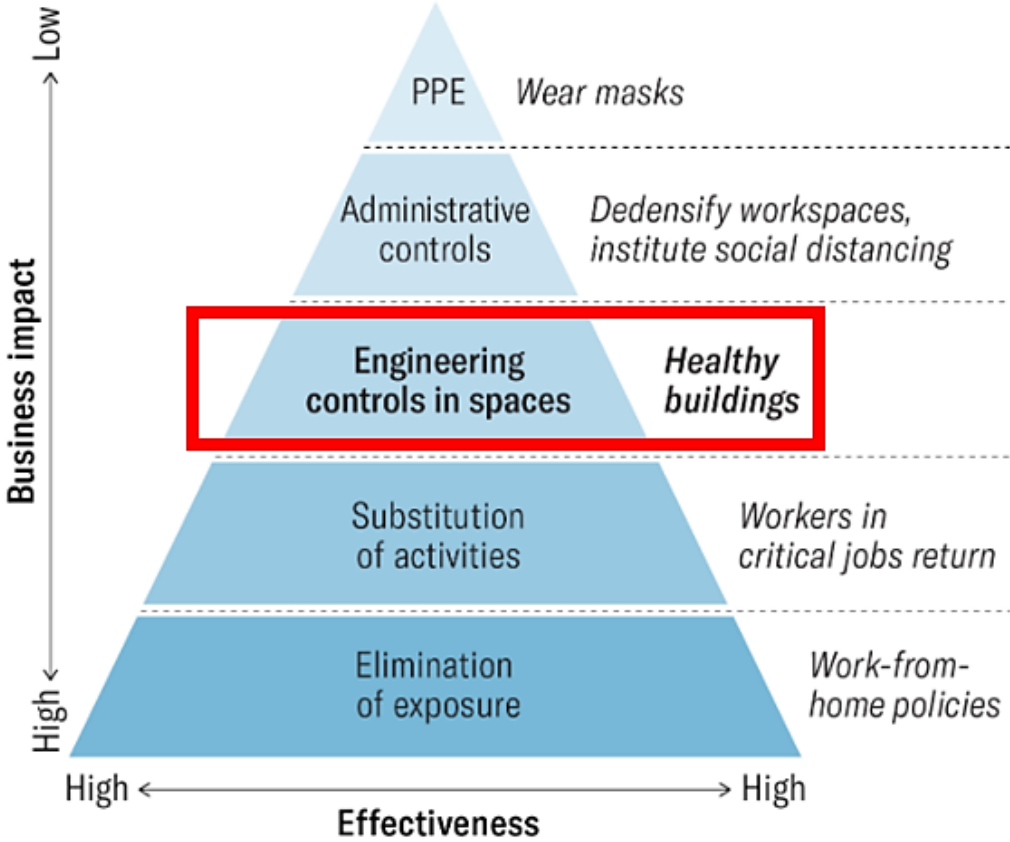
- Far-field Aerosol: 26% ?
- Near-field Aerosol and Droplet: 51% ?
- Fomite and indirect droplet contact: 24% ?

RECALCULATE

[Disclaimers and Terms of Use](#)

Minimizing Risk in the Workplace

Using a hierarchy of controls as a response framework, companies can take a range of actions – weighing the effectiveness and financial impact of each – to combat Covid-19 in their buildings.



Note: "PPE" stands for personal protective equipment.
Source: Joseph Allen and John Macomber

1 – Local

1.1 – Ambiente Interno

1.2 – Ambiente Externo

2 – Máscara

2.1 – Conforto

2.2 – Vedação

2.3 – Capacidade de Filtragem

3 – Tipo de atividade/evento/comportamento

3.1 – Repouso (menor geração de aerossóis)

3.2 – Cantar/Gritar/Tossir/Espirrar (maior geração de aerossóis)

4 – Variáveis ambientais (Lei Federal 13.589/18 – ANVISA RE-9)

4.1 – Temperatura (Acima de 23° C)

4.2 – Umidade Relativa (Entre 40 - 60%)

4.3 – Renovação do Ar / Filtragem

5 – Tempo de Exposição

5.1 – Os aerossóis infectados podem permanecer no ambiente, mesmo após as pessoas saírem da sala.

6 – Quantidade de pessoas

6.1 – Avaliação do Risco (Volume da sala e variáveis acima descritas)

7 – Risco Ocupacional (Engenharia de Segurança)

7.1 – Ajustar a quantidade de pessoas por sala e tempo de permanência (máximo sugerido)

7.2 – Ajustar o tempo sugerido de intervalo

Sala X

Ocupação: 25 pessoas (máximo)

Duração: 30 minutos (máximo)

Intervalo: 15 minutos

Mapa de Risco por Sala



Sugestão de Sensor de Material Particulado em Suspensão no AR

Fabricante: Sensirion

Modelo: SPS 30

In Stock: 1,222

Stock:	1,222	Can Ship Immediately
On Order:	1,960	Expected 9/20/2021
	3,640	View Expected Dates ▼

Factory Lead-Time: 20 Weeks [?](#)

Enter Quantity: [Buy](#)

Minimum: 1 Multiples: 1

Pricing (USD)

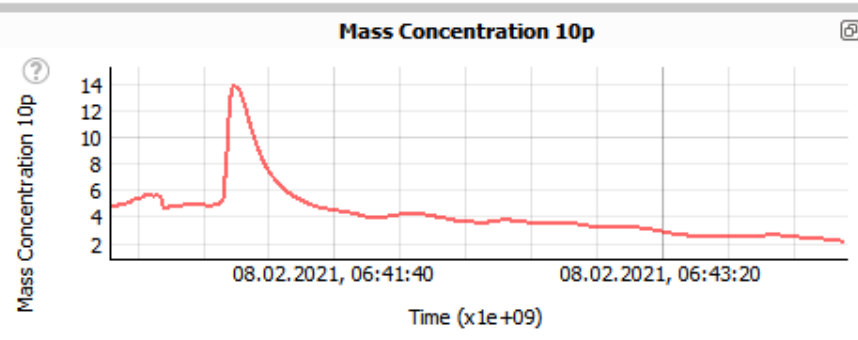
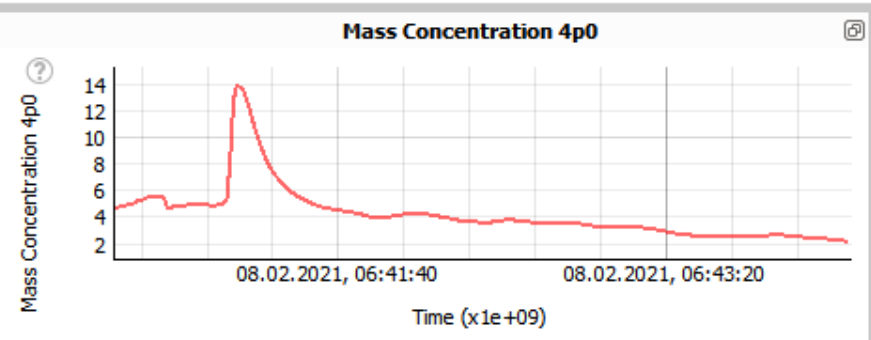
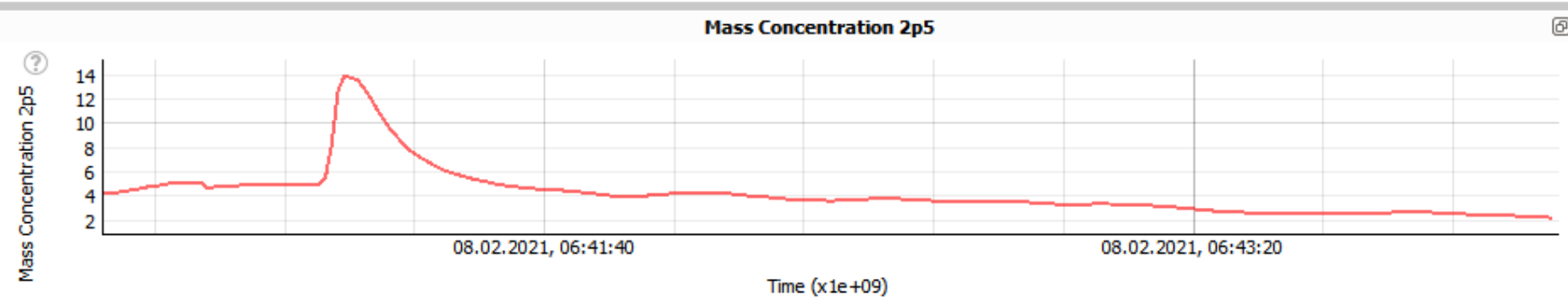
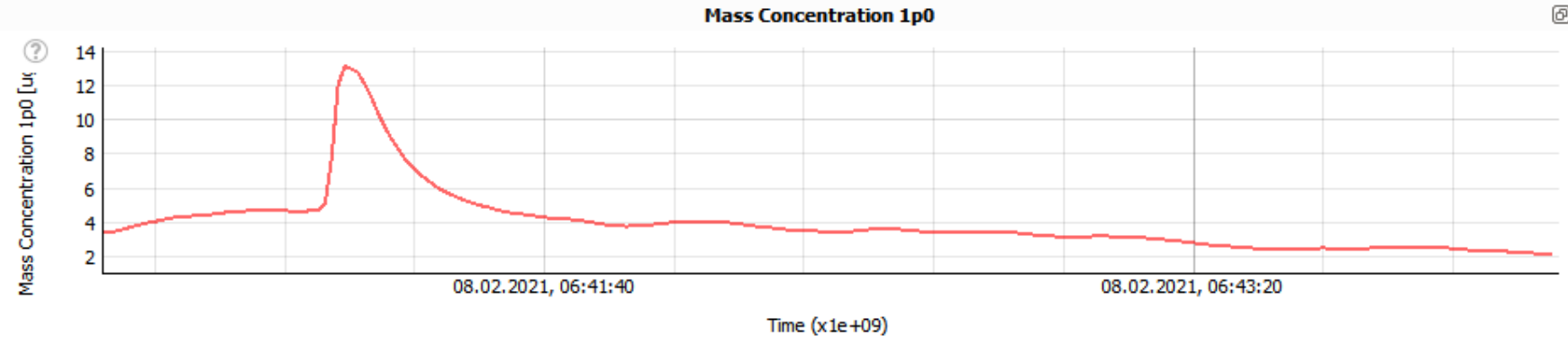
Qty.	Unit Price	Ext. Price
1	\$45.84	\$45.84
10	\$41.48	\$414.80



Refresh Add Files Remove Files

Sensors	Plot
SPS3x	<input checked="" type="checkbox"/>
694587A265200DA1	<input checked="" type="checkbox"/>

PM Mass Conc PM Numb Conc Particle Comp




Timeline Start | **Timeline End**

08.02.21 06:40:32 Reset timeline 08.02.21 06:44:16

Sugestão de Filtro de Material Particulado Ar condicionado SPLIT (Mercado Livre)




Novo | 3 vendidos

Filtro 3m Para Ar Condicionado Split #hb004556500 

R\$ 32⁶¹

em 6x R\$ 5⁴⁴ sem juros

[Ver os meios de pagamento](#)

 Envio para todo o país

Saiba os prazos de entrega e as formas de envio.

[Calcular o prazo de entrega](#)

Estoque disponível

Quantidade: 1 unidade  (39 disponíveis...)

[Comprar agora](#)

Corsi-Rosenthal Cube

Maintained by  Philip Neustrom 

 Edit



The **Corsi-Rosenthal Cube** (sometimes called a Comparetto Cube) is an inexpensive, do-it-yourself air cleaner that can be easily constructed out of a box fan and MERV-13 furnace filters. The Corsi-Rosenthal Cube can give whole-room air cleaning [performance comparable to commercial HEPA air cleaners that are 10x or more the cost](#). Total cost is around \$100USD (\$130CAD).

[Construction guide](#)

[Filter brands to potentially avoid](#)

[Variations](#)

[History](#)

[See also](#)

[News / media stories](#)

Construction guide



Figure 1. A Corsi-Rosenthal Cube. This cube was constructed with 4 MERV-13 filters and features a cardboard bottom.



Figure 2. A visual guide to constructing a Corsi-Rosenthal cube with a box fan and MERV filters with a top fan configuration. Air is pulled into filters (red arrows) and blows out of fan (green arrows). Photo by [CC-BY al.hu](#).

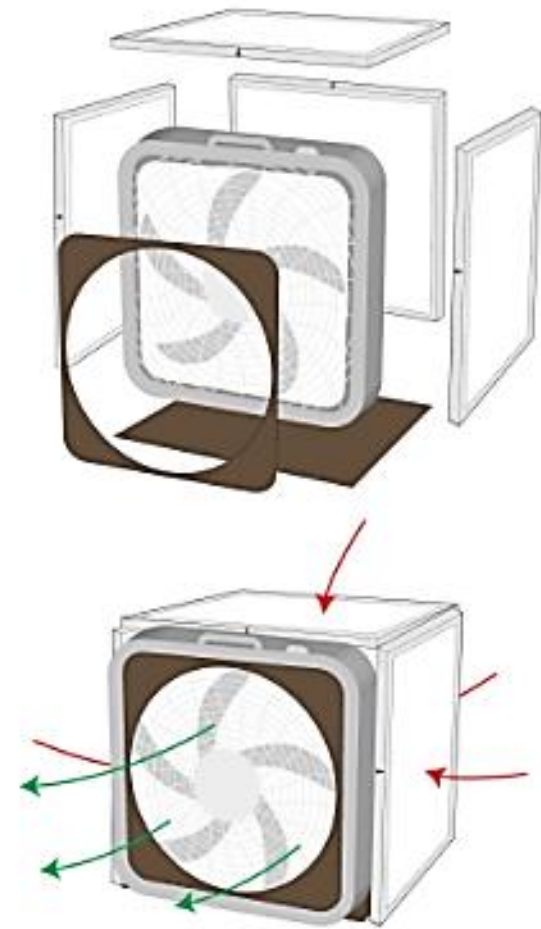


Figure 3. A visual guide to constructing a Corsi-Rosenthal cube with a box fan and MERV filters with a side fan configuration. Photo by [CC-BY al.hu](#).

Sugestão de Sensor de Temperatura, Umidade e CO2



Aranet4 Home: Monitor de qualidade do ar interno sem fio para casa, escritório ou escola [CO2, temperatura, umidade e mais] Portátil, alimentado por bateria, tela de tinta eletrônica, aplicativo para configuração e histórico de dados

Marca: SAF

★★★★☆ 57 classificações | 10 perguntas respondidas

De: BRL 1.598,67

Por: **BRL 1.474,38** + BRL 1.439,21 Depósito de taxas de importação e envio para Brasil

[Detalhes](#)

Você economiza: **BRL 124,29 (8%)**

Outros preços estão disponíveis em [mais opções de compra](#), com ofertas que podem não ser elegíveis para o Amazon Prime.

- Monitora precisamente a qualidade do ar interno – CO2, temperatura, umidade relativa e pressão atmosférica em tempo real.
- Avisos visuais e sonoros quando a concentração de CO2 fica muito alta.
- O visor E-Ink com eficiência energética garante vida útil da bateria superlonga para este dispositivo sem fios (até 2 anos)
- Aplicativo para smartphone para visualização de dados históricos (suporta iPhone e iPad com iOS 12 ou posterior, dispositivos Android com Nougat 7.0 ou posterior, compatível com Bluetooth 4.1 ou posterior).
- Usa tecnologia de sensor infravermelho não dispersivo (NDIR) para as medidas mais precisas de CO2.

BRL 1.474,38

+ BRL 1.439,21 Depósito de taxas de importação e envio para Brasil [Detalhes](#)

Envio e Detalhes da Taxa

Preço	BRL 1.474,38
Envio AmazonGlobal	+ BRL 72,24
Depósito estimado para imposto sobre a importação de produtos estrangeiros	+ BRL 1.366,97

Total BRL 2.913,60

Transação segura

Enviado por Amazon

Vendido por ARANET USA

Incluir recibo de presente para facilitar a devolução

Adicionar à Lista



we continuously build new stock ... thanks for all your interest!

CO2 Monitor aka Ampel - DIY Octopus based CO2 sensing/alerting kit

\$85.00

 No shipping info available.
Set destination country to see options

On A Break

Sign up and we'll send a reminder when the seller returns!

Email*


- Join our mailing list and stay updated about pioneering hardware and Tindie community activities.

Get Reminder

About Seller

Fab-Lab.eu



 Stuttgart, BW, Germany

Sensor de CO2,
Temperatura e
Umidade
Relativa (Monte
você mesmo)

Sugestão de Desinfecção de AR via UV-C



Novo | 37 vendidos




**Luminária Germicida Uv-c
Lâmpada Uvc Esterilizador
Philips**



R\$ 1.199

em 12x R\$ 99⁹² sem juros

[Ver os meios de pagamento](#)

 **Chegará grátis amanhã**  **FULL** 

Somente para SP capital e regiões da Grande SP

Comprando dentro dos próximos **39 min**

Benefício Mercado Pontos

[Ver mais formas de entrega](#)

Cor Da Base: **Prata**

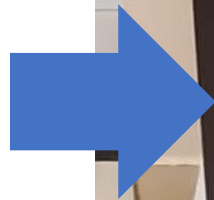
Cor Do Abajur: **Prata**

Vendido por [ABASTECE COMPONENTES](#)

MercadoLíder | 6.354 vendas

Intervenção de Baixo Custo para Escolas e Universidades

UVC Lamp
254 nm





Novo | 2001 vendidos

Osram - Lamp + Reator + Soq. Puritec 15w Uv-c Germicida



★★★★★ 55 opiniões

MAIS VENDIDO 18º em Iluminação para Aquários

R\$ 135⁹⁰

em 12x R\$ 12⁹⁶

[Ver os meios de pagamento](#)

Chegará grátis amanhã domingo

⚡ FULL ▾

Somente para SP capital e regiões da Grande SP

Comprando dentro das próximas 6 h 2 min

Benefício Mercado Pontos

[Ver mais formas de entrega](#)

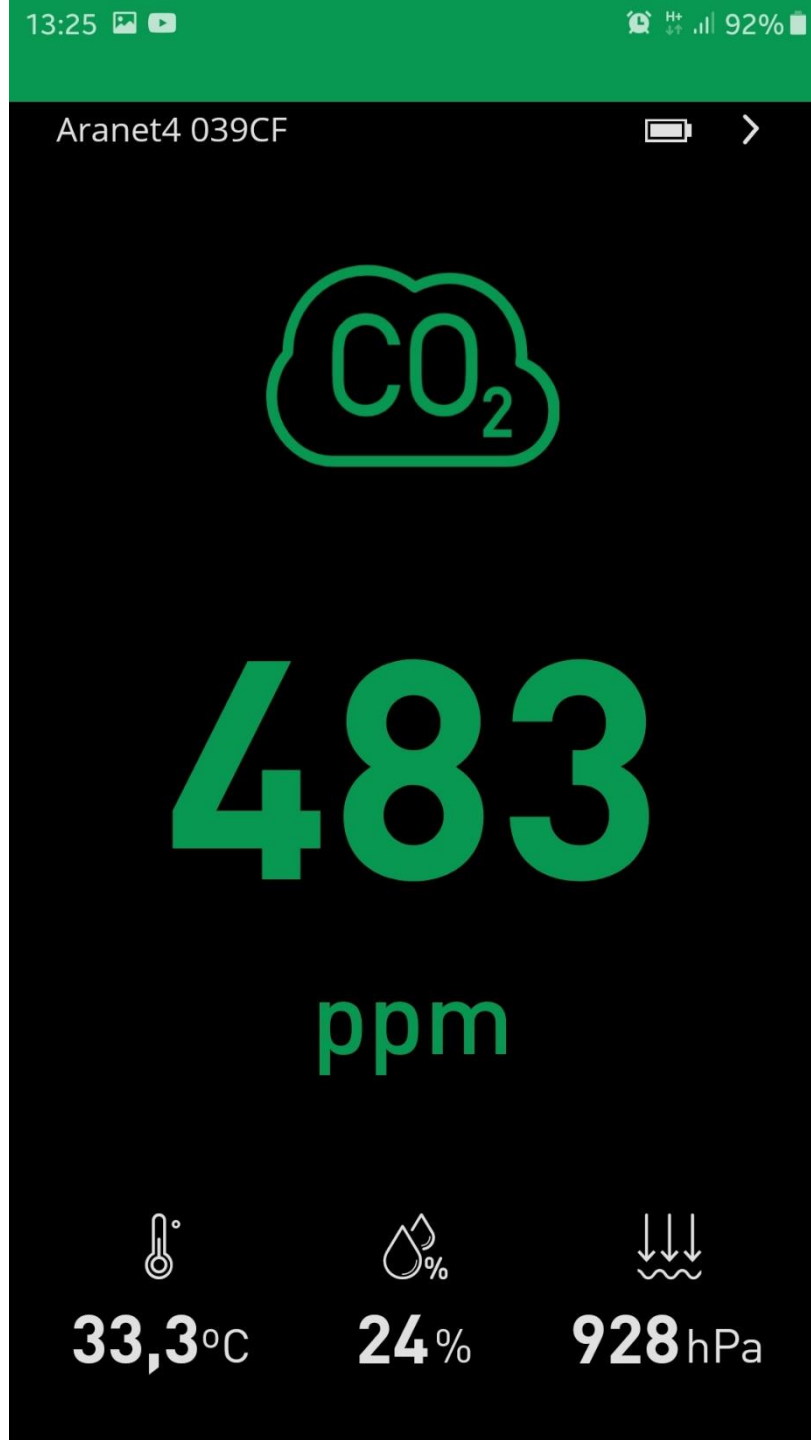
Retire grátis a partir de segunda-feira em uma agência Mercado Livre

Benefício Mercado Pontos

[Ver no mapa](#)

Estoque disponível







OU



Novo | 2001 vendidos

Osram - Lamp + Reator + Soq. Puritec 15w Uv-c Germicida

★★★★★ 55 opiniões

MAIS VENDIDO 18ª em Iluminação para Aquários

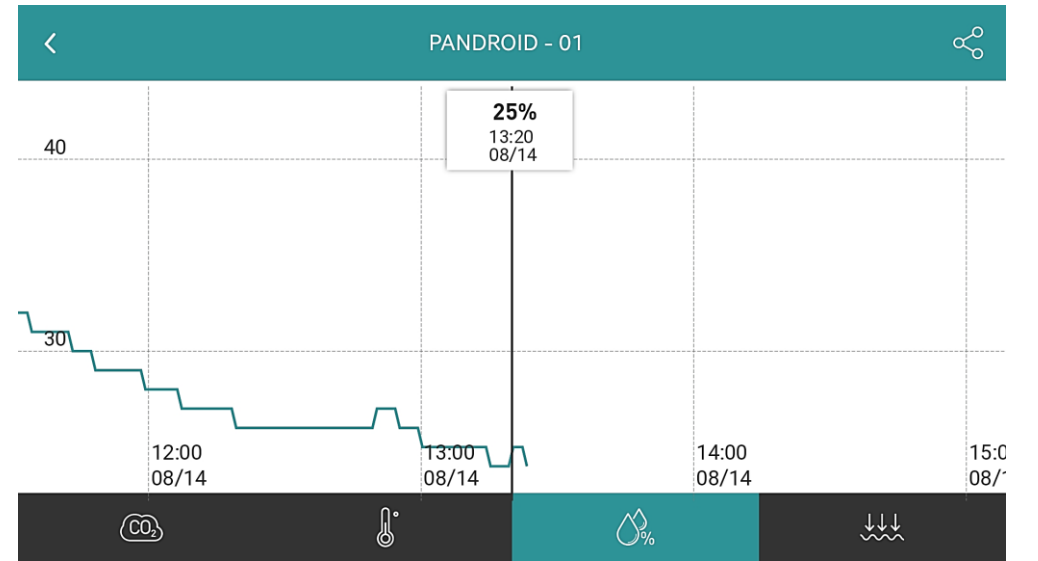
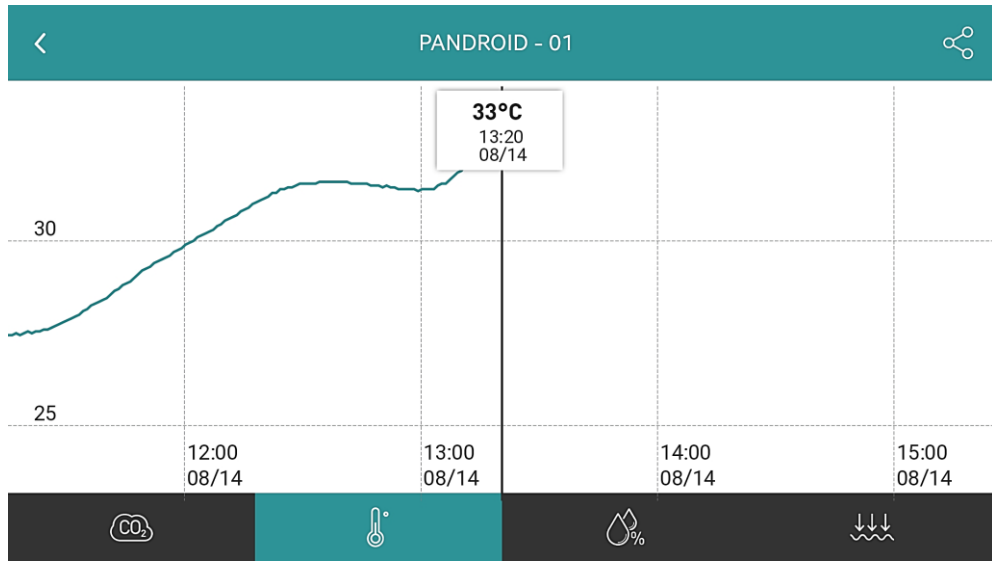
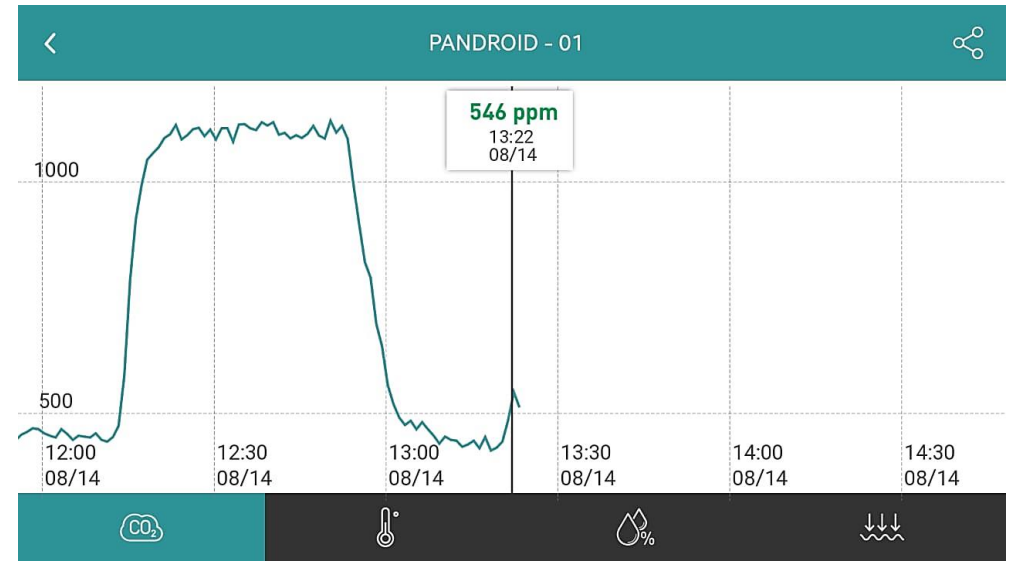
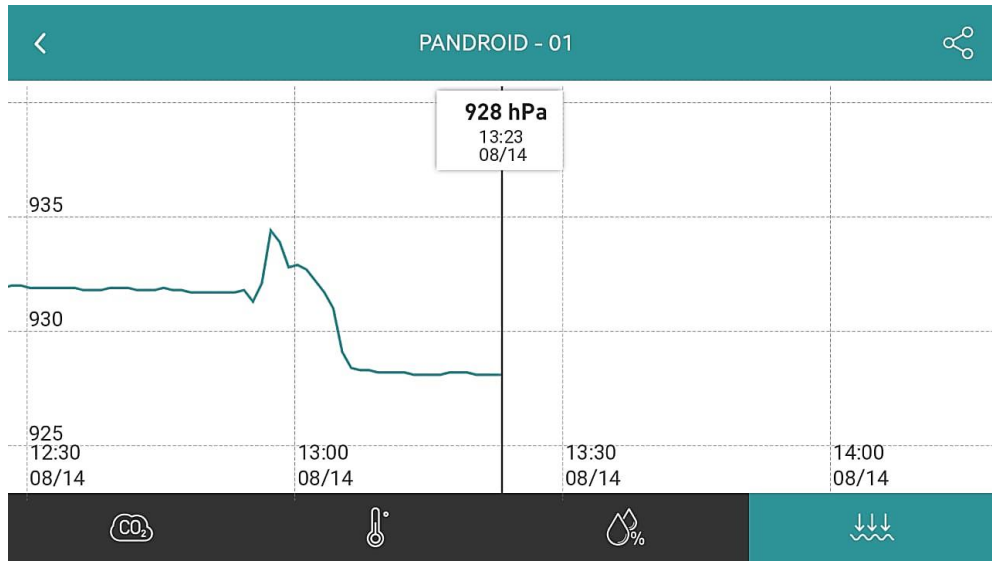
R\$ 135⁹⁰
em 12x R\$ 12⁹⁸

[Ver os meios de pagamento](#)

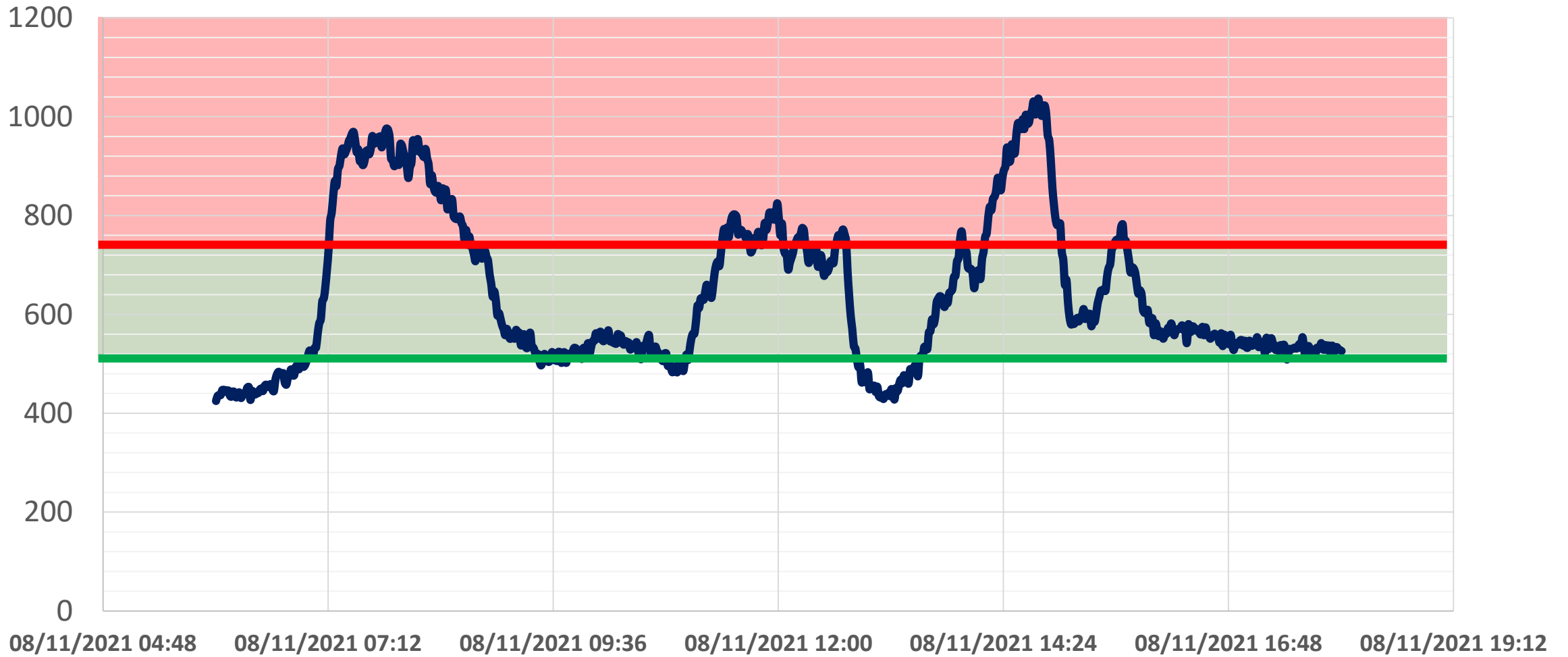
Chegará grátis amanhã domingo
FULL
Somente para SP capital e regiões da Grande SP.
Comprando dentro das próximas 6 h 2 min
Benefício Mercado Pontos
[Ver mais formas de entrega](#)

Retire grátis a partir de segunda-feira em uma agência Mercado Livre
Benefício Mercado Pontos
[Ver no mapa](#)

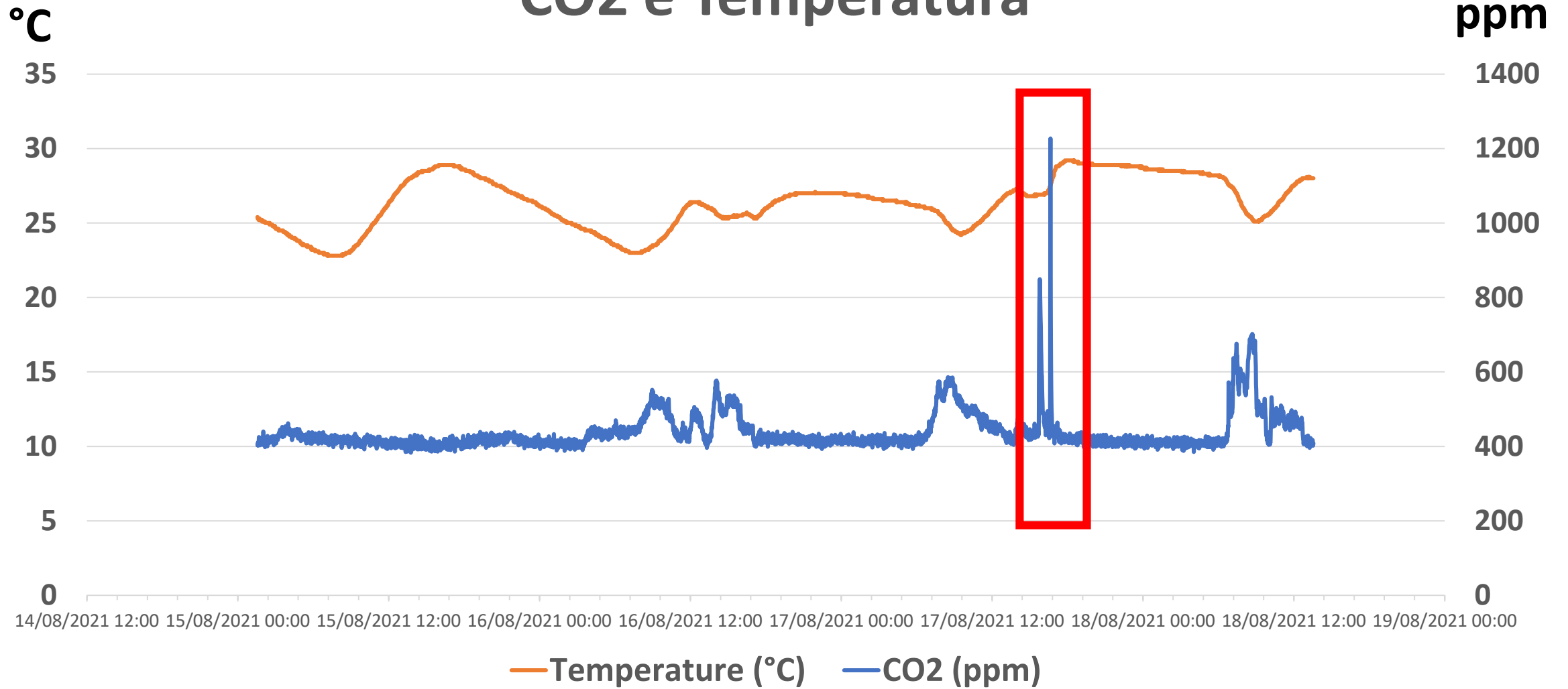




Concentração de CO2 na sala de aula



CO2 e Temperatura



OSPE Air Quality Calculator

http://ospe-calc.herokuapp.com/Air_Changes_-_Ventilation

Air Changes from Ventilation

Estimate the number of outdoor air changes based on indoor CO2 levels.

Room

Room Volume

200

- +

Volume Unit

cubic meters

People

Number Occupants

20

- +

Average Age

11 to <16

▼

Activity

Sitting tasks, light effort (office work) - Met 1.5

▼

CO₂

Outdoor CO2	Steady-State Indoor CO2
460	610

Results

CO2 generated per person		= 0.00509 lps/person
Outdoor airflow per person	$\frac{0.00509 \text{ lps/person}}{610 \text{ ppm} - 460 \text{ ppm}} \cdot 10^6$	= 33.9 lps/person
Total outdoor airflow	33.9 lps/person · 20 people	= 678.7 lps
Air changes per hour	$3.6 \cdot \frac{678.7 \text{ lps}}{200 \text{ m}^3}$	= 12.22 ACH

12.2 ACH

Excellent!