

# The Impact of Inhalers on the Environment & Climate Change

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# Acknowledgments

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# Land Acknowledgment

We would like to begin by acknowledging that the land on which we gather, *University of British Columbia, Point Grey Campus (Vancouver)*, is the traditional, ancestral, and unceded territory of the xwməθkwəy̓əm (Musqueam) People.

# Learning Objectives



Understand the overall impact of metered-dosed inhalers (MDIs) on climate change



Learn the key considerations for selecting an inhaler



Understand why MDIs have a negative impact on the environment and climate change



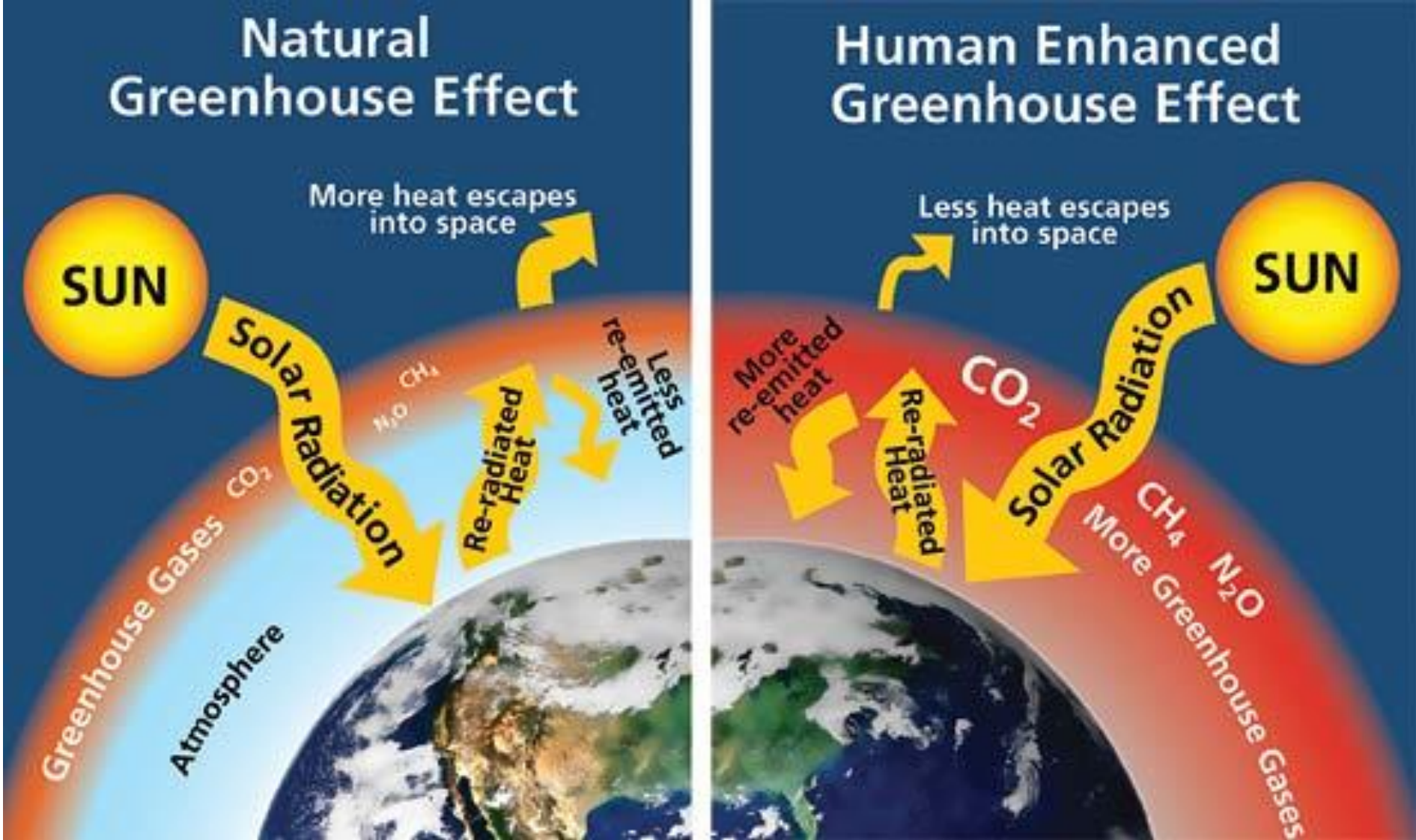
Identify ways that pharmacists can help reduce the impact of inhalers on the environment and climate change



# Environmental Impact of the HealthCare System

- The Canadian healthcare system contributes **4.6%** of the total annual national greenhouse gas (GHG) emissions (Eckelman et al., 2018)
- **25%** of the healthcare system's emissions are from **pharmaceuticals** (Eckelman et al., 2018)
  - For example, MDIs can release potent GHG emissions

# The Greenhouse Effect



# Background on Inhaler Devices

- Inhaler devices are specifically designed to deliver medication to the lungs.
- Three main types of inhalers:
  - **Metered-Dose Inhalers (MDI)**
    - e.g., salbutamol
  - Dry-Powder Inhalers (DPI)
    - e.g., budesonide/formoterol
  - Soft-Mist Inhalers (SMI)
    - e.g., tiotropium



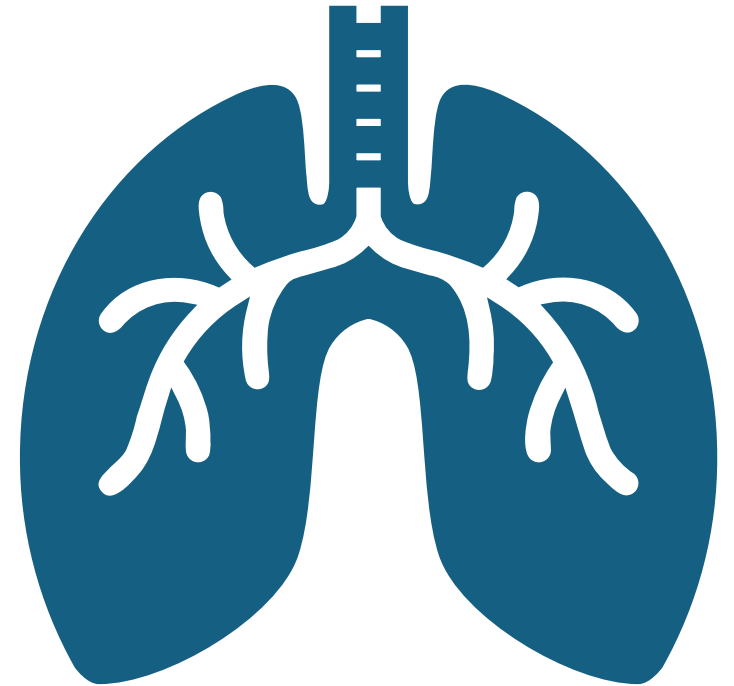
# Things to Consider When Selecting an Inhaler

**From the Canadian Thoracic Society (Gupta et al. 2023)**

- Patient preference
- Impact of inhaler device on adherence
- Inhalation technique (patient ability)
- Inspiratory flow rate/pressure required for adequate medication delivery (patient ability)
- Patient age
- Cost for patient and/or public healthcare system
- Side effect profile
- Environmental footprint

## **Other considerations:**

- Indication (asthma, COPD etc.)
- Contra-indications (e.g., allergies)





# Things to Consider When Selecting an Inhaler: Environmental Impact



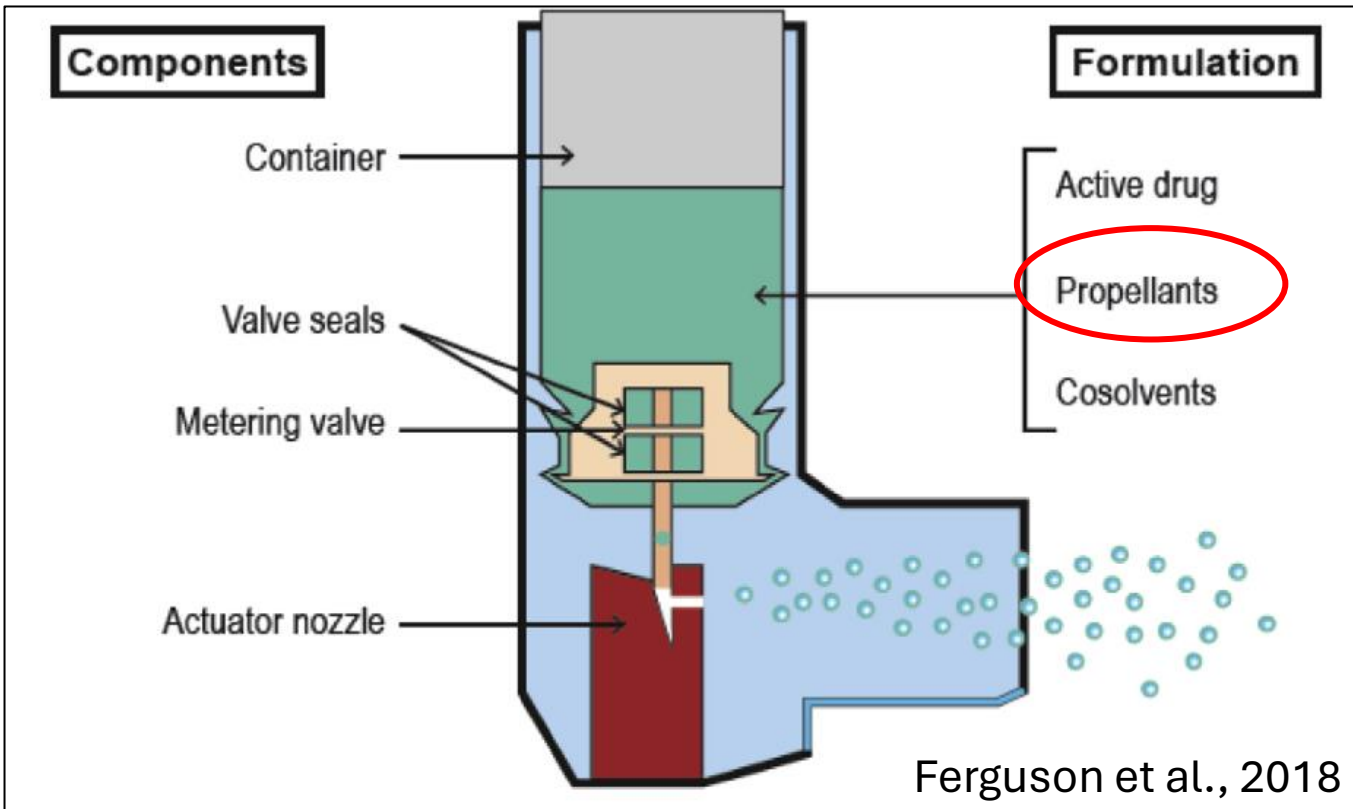
Woodcock et al., 2022

## "Cradle-to-Grave" Impact

- Inhalers impact the environment throughout their life cycle
- MDIs: use/utilization phase contributes most to total carbon footprint <sup>3,4,5</sup>
- DPIs: manufacturing phase contributes most to total carbon footprint <sup>3,4,5</sup>

Click [here](#) for more information about the impact of inhalers at the different life cycle stages

# How MDIs work



MDIs have different components:

- Canister: contains the medication
- Plastic casing + Actuator: delivery of the medication

Propellants:

- Provide the pressure needed to force medication out of the canister

# Propellants are potent greenhouse gases!

**TABLE 1** Global warming potential (how powerful greenhouse gas is relative to CO<sub>2</sub>) of propellants used in current and possible future MDIs<sup>4</sup>

Name	Global warming potential
CO <sub>2</sub> (carbon dioxide)	1
HFO 1234ze (potential new propellant in future MDIs)	<1
HFA152a (potential new propellant in future MDIs)	138
HFA-134a (used in most current MDIs)	1300
HFA-227ea (used in some current MDIs)	3350
CFC-11 (previously used in MDIs)	4660
CFC-12 (previously used in MDIs)	10 200

Wilkinson & Woodcock, 2021

## Timeline:<sup>7</sup>

**1960s:** MDIs contained chlorofluorocarbons (CFC)

**1980s:** Discovery that CFCs breakdown the ozone layer and are greenhouse gases, phase out begins

**2016:** Worldwide phase out of CFCs completed

**Current:** Most MDIs contain hydrofluorocarbons (HFA)

- Do not deplete ozone BUT are still POTENT greenhouse gases
- HFA-134a used in salbutamol (Ventolin<sup>®</sup> MDI devices)

# MDIs are not all bad!

- MDIs are very effective drug delivery devices
- They are generally inexpensive
- Useful for those with limited lung capacity and pediatrics
  - Can also utilize with a spacer to reduce handling/technique errors
- Not all MDIs are made the same
  - "Low-flow MDIs" have a lower carbon foot-print
- Patient preference
  - Some patients prefer MDIs and switching to another inhaler device (e.g., DPI) may result in inadequate technique/exacerbation of condition



# Alternatives to High-Flow MDIs

## BC Inhalers

A guide to **green** inhalers in  
British Columbia, Canada

Inhaler Carbon Emissions:

Low

Moderate

High

- DPIs and SMIs have lower carbon emissions than MDIs
- Low-flow MDIs have lower carbon emissions than high-flow MDIs due to presence of HFA sparing agents (Stoynova & Culley, 2023)

## SABA



**Bricanyl  
Turbuhaler**  
terbutaline



**Ventolin  
Diskus**  
salbutamol



**Teva-Salbutamol  
MDI**  
salbutamol



**Ventolin  
MDI**  
salbutamol

# Alternatives to High-Flow MDIs: Terbutaline

Low Emissions

## Bricanyl Turbuhaler (DPI)

terbutaline 0.5 mg/dose



[How to use a Turbuhaler.pdf](#)

**Age Indication:** adults and children  $\geq 6$  years

**Duration:** 4-6h

**Adult Instructions:** one inhalation every 4 hours as needed; if dose is ineffective may repeat after 5 minutes

**Cost:** \$23.88 for 120 doses

Covered

Teva-Salbutamol MDI- \$18.45 for 200 doses

Bricanyl Turbuhaler DPI - \$23.88 for 120 doses

Ventolin MDI - \$20.29 for 200 doses

Ventolin Diskus DPI - \$25.24 for 60 doses

\*Costs as of March 2024

## Rx

Date: February 28, 2024

Patient: Jill Smith

DOB: October 14, 2001

Terbutaline 0.5mg/dose

Dry Powder Inhaler

SIG: Inhale 0.5mg Q4H PRN; if ineffective may repeat after 5 mins (max 6 doses/day)

QTY: 1 inhaler

Refill: 2

Dr. J Doe

Prescriber

0001

Provider No.

# Pharmacist's Role: Assess & Counsel

## Assess adequate treatment of underlying condition

- Ensure underlying disease is adequately treated per guideline recommendations
- Ensure inhaler choice is appropriate based on patient-specific and disease specific factors
- Ensure no over-reliance on reliever therapy (e.g., refilling reliever therapy often may be a red flag)

## Patient counselling on proper technique

- Demonstrate technique, assess for understanding, follow up
- Refer to resources (e.g., videos, infographics)
- Recommend use of spacer with MDI—handling/technique errors with MDI alone are greater compared to DPIs

# Example: CASCADES Canada Patient Resources

## Correct Inhaler Usage Resources

Using your inhaler correctly will ensure that your treatment is the most effective, that you use the inhaler in its entirety, and if you are using an aerosol inhaler, prevent the release of aerosol into the air.

Click on the inhaler category or image to view a video demonstrating the correct technique for usage.

Diskus			Respiclick	Inhub
Ventolin Diskus	Flovent Diskus	Advair Diskus	Aermony Respiclick	Wixela Inhub
Turbuhaler			Genuair	
Bricanyl Turbuhaler	Symbicort Turbuhaler	Pulmicort Turbuhaler	Oxeze Turbuhaler	Tudorza Genuair
Asmanex Twisthaler	Anoro Ellipta	Trelegy Ellipta	Incruse Ellipta	Breo Ellipta
Atecura Breezhaler	Onbrez Breezhaler	Ultibro Breezhaler	Enerzair Breezhaler	Seebri Breezhaler
Respiimat		Aerolizer	Aerosol Inhaler	
Spiriva Respiimat	Combivent Respiimat	Foradil via Aerolizer	With Spacer (Recommended)	Without Spacer

To view all inhaler videos, go to:

Canadian Lung Association: How to use your inhaler

<https://www.lung.ca/lung-health/get-help/how-use-your-inhaler>

This project was undertaken with the financial support of the Government of Canada. Ce projet a été réalisé avec l'appui financier du gouvernement du Canada.



## Do you want to help reduce the impact that aerosol puffers have on the environment?

**1** Talk with your health care provider to make sure you have been tested for asthma or COPD

It can be harmful to use an inhaler you may not need<sup>2</sup>

actual cause of your symptoms is addressed

medication side effects

environmental impact of the aerosol puffer

many spent on medication you don't need

About 1 in 4 Canadian adults who use asthma inhalers do not actually have asthma.<sup>1</sup> Watch [this video](#) to learn more about the importance of confirming your diagnosis.

If you use your blue reliever inhaler 3 or more times a week, your asthma may not be well-controlled. Take [this test from Asthma Canada](#) to find out more.

**2** Ask your health care provider if other lower carbon inhalers are right for you

The carbon footprint of these alternatives can be 10 times smaller than an aerosol puffer.<sup>1</sup>

There are many other types of inhalers with a lower carbon footprint than an aerosol puffer

Most of these alternatives are called dry powder inhalers - they have no aerosol and they release the medication as you breathe in. These

If an aerosol puffer is the best option for you

<sup>10</sup>Resources Link: <https://cascadescanada.ca/action-areas/pharmacy-and-prescribing/your-inhaler/>



# Pharmacist's Role: Promote Appropriate Disposal

## Patient counselling on proper disposal

- Remind patients EACH time they pick up an inhaler to bring it back for disposal
- Encourage patients to keep track of doses so they will be able to better assess when inhaler is truly empty
- Find a balance between emphasizing the environmental impact of improper disposal, but also importance of using MDIs for their condition

## HOW TO DISPOSE OF YOUR INHALER

7 out of 10

  
inhalers are thrown away before being empty.<sup>1</sup>



When thrown into the garbage for landfill, inhalers release harmful greenhouse gases into the environment.<sup>2</sup>



Ensure that you are using your inhaler correctly and dispose of it when it is empty.



Ask your clinic or pharmacy to see if they have a recycling or disposal program.\*



Do NOT throw them in your household garbage or recycling.



Returning your inhaler to be recycled or incinerated can save the equivalent of up to



8 litres of gasoline<sup>2</sup>

\*If you live in British Columbia, Manitoba, Ontario or Prince Edward Island, visit [healthsteward.ca](https://healthsteward.ca) to find what local pharmacies take back used inhalers.

<sup>1</sup>Roome C, Bush O, Steinbach I, et al. (2021). 162 Reducing the environmental impact of inhaler use and disposal within paediatrics and the local community. Archives of Disease in Childhood, 106: A41-A42.  
<sup>2</sup>Wilkinson AJ, Braggins R, Steinbach I, Smith J. (2019). Costs of switching to low global warming potential inhalers. An economic and carbon footprint analysis of NHS prescription data in England. BMJ Open, 9(10).

Adapted with permission from Justin O'Connor-Cook, PharmD student, and Brenda Chang, Clinical Pharmacy Coordinator, at Unity Health. This project was undertaken with the financial support of the Government of Canada. Ce projet a été réalisé avec l'appui financier du gouvernement du Canada.



# Pharmacist's Role: Recommend, Advocate & Educate

## Shared decision making on inhaler choice

- Assess if recommending an alternative to MDIs is appropriate to discuss with patients
- Remember choice of inhaler needs to be a patient informed decision and patient preference should **always** be respected

## Advocate and Educate

- Promote the use of environmentally sustainable pharmaceuticals
- Advocate for the incorporation of environmental impact in the assessment of funding, approval, and use of medication
- Disseminate knowledge regarding the impact of pharmaceuticals on the environment and interventions we can make

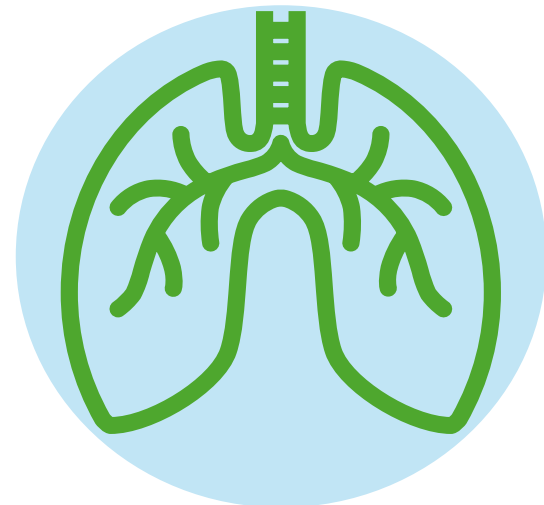
# Initiatives

- **CASCADES**
  - Playbooks
  - Educational courses
- **Canadian Society of Hospital Pharmacy**
  - Sustainability Task Force
- **Canadian Association of Pharmacy for the Environment**
  - Developed in 2022
  - Mission "promote and improve planetary health among the Canadian pharmacy profession"
- **International Federation of Pharmacy**
  - Environmental Sustainability policy 2023



# Summary

- The environmental impact of MDIs on the environment is substantial
- Alternatives to high-flow MDIs exist and can be considered when appropriate
- Pharmacists' have a vital role to play in addressing and reducing the impact of inhalers on the environment
- Patient preference should always be respected when recommending inhaler therapy



# Questions/Comments/Feedback

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