Moving Toward a More Sustainable Future With pMDIs

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It is now more than half a century since patients were introduced to the pressurized metered dose inhaler (pMDI) as a convenient, effective vehicle for the symptomatic relief and sustained management of conditions such as Asthma and Chronic Obstructive Pulmonary Disease (COPD). This innovation has since become a dominant drug-delivery device for Asthma and COPD patients, helping millions of people around the world. Recent history has also seen us better understand how human activities can negatively impact our planet, which includes growing evidence of the causal link between increasing levels of atmospheric carbon dioxide and rising global temperatures.

These important revelations in environmental science have had significant consequences for pharmaceutical companies and their supply chain partners, particularly in relation to pMDIs. In 1987, for example, the Montreal Protocol set out a pathway for eliminating the use of compounds proven to be harmful to the ozone layer, which included chlorofluorocarbons (CFCs), which were also used as propellants in pMDIs. Although the industry was given an exemption to the 10-year CFC phase-down deadline to maintain continuous provision to patients with respiratory conditions, the industry urgently looked for replacement propellants with the necessary attributes of low toxicity and flammability, but also with reduced global warming potential (GWP).

The answer was found in the form of two hydrofluoroalkanes (HFAs): 1,1,1,2-tetrafluoroethane (HFC 134a) and 1,1,1,2,3,3,3-heptafluoropropane (HFC 227a). The first to be introduced was HFA 134a, approved by the US Food and Drug Administration (FDA) in 1996 in an MDI for albuterol sulfate.

In the 25 years since, the number of products incorporating HFA-based propellants has continued to rise, with the FDA having banned the manufacture and sale of CFC-based products entirely in 2012. While there has been notable innovation around non-propellant-based technologies such as dry powder inhalers (DPIs) and, more recently, soft mist inhalers (SMIs), HFA-based products now dominate, with at least 13 companies producing branded or generic HFA-based inhalers for the US market.[1]

Over time, as climate-related concerns have intensified, the focus on limiting the use of products with GWP has brought a sharper focus on the wider group of fluorocarbons known as F-gases, which encompass HFC 134a and HFC 227a. F-gases account for around 2% of total greenhouse gas emissions and are predominantly used in the refrigeration and air-conditioning industry. While they may not be responsible for ozone depletion, they are known to contribute to global warming, and the Kigali Amendment to the Montreal Protocol aims to have reduced use by over 80% by 2047.

Although pMDIs, which contribute a comparatively low 2.4% of total F-gas emissions, are subject to varying exemption protocols across different regulatory jurisdictions, pharmaceutical stakeholders are again working to secure the use of lower carbon propellants. This effort is given even greater urgency as reduced volumes of industrial-grade gases are expected to negatively impact the manufacturing cost of medical-grade gases.[2,3]

Aptar Pharma – Working Collaboratively With Our Pharmaceutical Partners

At Aptar Pharma, we are committed to supporting our pharmaceutical partners on the next phase of the sustainability journey. As it stands, the two leading candidates to replace HFAs are HFC 152a and HFO1234ze, both of which present significantly lower GWP compared with existing HFA propellants. Of course, this is not the only attribute such gases must demonstrate, and key factors such as critical thresholds for levels of toxicology and flammability must also be considered in addition to the economic aspects of these respective alternative propellants compared with the future costs of current propellants, and also the costs of alternative delivery platforms.

Our company's work in this area is dedicated to evaluating the compatibility of Aptar Pharma metering valves with both HFC 152a and HO1234ze. Drawing on the expertise within our R&D team, we are exploring multiple model formulations and valve configurations, working collaboratively with our pharmaceutical partners and other key stakeholders.

It is only through this level of active collaboration and partnership that we will ensure the safe development of new forms of lower GWP-propellant pMDI devices, answering a fundamental environmental need, and maintaining the convenience and familiarity of a proven drug delivery device that has satisfied patient need for the past 75 years.

References

1. https://www.epa.gov/sites/production/files/2021-03/documents/epa-hq-oar-2021-0044-0002_attachment_1-mdis.pdf
2. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7410333/
3. https://ec.europa.eu/clima/sites/clima/files/f-gas/docs/20201216_c_2020_8842_en.pdf

Working daily to improve the health of our patients and our planet

As the market leader in pMDI valve technology for asthma and COPD, Aptar Pharma is committed to improving the environmental impact of our products and ensuring our devices are safe and effective.

That's why we are actively engaged in defining the next generation of pMDIs, finding more sustainable solutions with alternative propellants that align with our sustainability commitments as well as those of our partners and their patients.

To find out more about how Aptar Pharma is advancing pMDI technologies, please visit **www.aptar.com/pharmaceutical /delivery-routes/pulmonary/**

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