

Inhalation devices and the environment: friend or foe?

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A study published on www.greeninhaler.org, highlighted that with regard to environmental impact, there is a significant difference between an MDI device and a DPI device. For instance, it has been shown that the life cycle of an MDI generates 28 kg of CO₂ emissions, which is equivalent to driving a new, medium-sized car for 294 km, roughly from Milan to Venice. To give an idea of the impact; in the UK alone 73 million inhaler devices are prescribed by doctors every year and 63% of them are placed in the domestic waste bin after use, meaning they end up in a landfill site (ref. SDU Sustainable Development Unit – pilot scheme for NHS Trust). In conclusion, MDI devices are harmful to the environment both in terms of waste material, as well as with regard to greenhouse gas emissions, because the residual gas from the canister is released into the atmosphere.

Nowadays, there is a vibrant debate ongoing in the scientific community about MDI versus DPI and it is certainly interesting to follow the developments. However, for the purpose of this Point of View, let us focus on DPI's in order to discuss their potential in reducing the environmental impact of inhalers. Today, the materials approved of by both FDA and EMA and most commonly used for the production of inhaler devices, are all hydrocarbon-based oil derivatives such as: ABS, HDPE, LDPE, PP, PE, PO and PBT. It is common knowledge though, that other materials could be used, including but not limited to PLA for which there could indeed be important counterclaims – the most significant of which is that the cultivation of the necessary raw material goes at the expense of food production. There are several other possibilities such as the Mater-Bi (brand of Novamont) which is a polymer obtained out of corn starch and which can be biodegraded by microorganisms producing H₂O, carbon dioxide and methane or the Bioplast Gf106/02 (made by Biotec-Sphère) which comes from potato starch. Another interesting possibility is PVA, polyvinyl acetate, with applications in medicinal sponges for fluid control or in ophthalmology specifically as a lubricant for contact lenses. And last but not least, PHA (polyhydroxy acids) or PHBV (polyhydroxybutyrate-valerate), which ironically come from bacteria that could prove lethal to a Cystic Fibrosis patient (cfr. *Pseudomonas aeruginosa*), yet are perfectly suited

to produce an inhaler device that might save a patient's life. It is a matter of fact that several production technologies and plastic biocompatible/biodegradable polymers are available for the device manufacturers. Unfortunately, FDA and EMA are slow in providing the necessary regulation, effectively impeding R&D and investment.

At Pharmadevices we do not do sarcasm, but rather see opportunities. That's why we have started internal trials and are evaluating the use of different raw bio-materials for our manufacturing process. We have developed a new DPI, taking into account the entire life-cycle of the device, starting from the simple question: **"what happens to a device once its functionality is exhausted?"**. Taking into account the needs of patients and users of medical devices, as well as their increasing awareness about the impact of their product on climate change, we developed a new disruptive inhaler device which is simple to be produced, simple to be used, simple to be recycled.

Most of the DPI's currently present on the market, are made out of more than one material, for instance out of two different plastic polymers or out of a single polymer plus stainless steel. In order to be recycled, these inhalers must be taken apart and the materials must be separated, a complex process. Our inhaler device is developed out of a single polymer, making recycling a lot easier. On top of that we have chosen a business model involving all stakeholders, such as manufacturers of plastic raw materials, researchers in the field of biomaterials, pharmaceutical companies, material recycling centres and pharmacies/drugstores to create the first **circular economy** of this market which includes both **waste prevention and recycling**. A **"virtuous cycle for effective recycling"**.

"It's no longer time to wait and then react. It's time to act, all together"

Pharmadevices is an Italian start-up engaged in design, development, production and marketing of inhalers and medical devices.





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Point of View

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Alberto Mercandelli

Alberto Mercandelli: Alberto has 25+ years of experience in sales and international relationships, 10+ of which spent in Pharma business, dedicated to Inhalation applications. He took part to International Projects with Universities and Research Centres by contributing as co-author of scientific publications and posters. He is passionate about establishing relationships, thrilling to work in a team, always contributing with professionalism and energy.

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The European Respiratory Cluster Antwerp (eu.reca) is a dynamic knowledge platform with a focus on the lung. In order to improve therapies and quality of life of patients, develop new products, reduce societal costs and deal with the challenge of air pollution, we believe it is necessary to connect and unite all stakeholders in an expert community.

“As a catalyst for innovation, we want to bring promising start-ups into contact with leading companies, pharma with product designers, academics with entrepreneurs, and investors with patients. That is why our approach is based on interaction. Our extensive network ensures a quality pool of participants. Our workshops and symposia encourage in-depth dialogue.”
Frank Pieters, Founder and Chairman of the Board.

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