

Letters

MOLD OVERGROWTH ON A DRY POWDER INHALER DURING ROUTINE TREATMENT OF PERSISTENT ASTHMA

Inhaled corticosteroids significantly affect the management of allergic asthma.¹ The development of dry powder inhalers (DPIs) has improved drug administration without the need for external spacer devices.² These devices are held directly between the lips. Fungal colonization of these devices has not previously been described.

We report a case of fungal overgrowth within a DPI after clinical use in a 9-year-old asthma patient. Initial spirometry before initiation of therapy with inhaled budesonide revealed a forced expiratory volume in 1 second (FEV₁) of 1.27 L (69% predicted), a forced vital capacity (FVC) of 2.14 L (103% predicted), and an FEV₁/FVC ratio of 0.59, with a 40% improvement in the FEV₁ to 1.78 L (97% predicted) after bronchodilator use. Skin prick testing revealed a 6-mm wheal to dog epithelium and *Dermatophagoides farinae* with negative test results to molds and other screening allergens. Therapy with budesonide delivered by the Turbuhaler effectively controlled symptoms and improved spirometry (FEV₁, 106% predicted; FVC, 127% predicted). The inhaler was subjected to routine use at normal environmental temperature and humidity levels encountered in the northeastern United States. It was not intentionally or unintentionally submerged in water. After 12 weeks of use, inspection of the device revealed black debris on the undersurface of the cap and within the inner surfaces of the device. The debris was sampled with a sterile swab and plated to potato dextrose agar and inhibitory mold agar with chloramphenicol (Remel). The plates were incubated at room temperature to reveal significant growth of *Candida parapsilosis* and *Cladosporium* species (Fig 1).

Up to 40% of asthmatic patients demonstrate sensitization to molds,^{3,4} and mold sensitization is a significant risk factor for severe exacerbations of asthma.⁵ Evidence suggests mold antigen exposure plays an important role in the development of asthmatic airway responses.^{6,7} Human saliva can facilitate detachment of *Candida* cells from inhaler surfaces and make them more easily inhalable.⁸ Active mold growth within a DPI may promote fungal colonization of the asthmatic airway, pose an infectious risk, and certainly increase exposure to fungal antigens. Such regular administration of mold spores with potent inhaled corticosteroids may promote allergic mycoses of the airway.

Although the shelf-lives of currently marketed DPIs are shorter than that of the Turbuhaler, this case suggests that physicians should be alert to the possibility of mold contamination within medical devices subject to repeated use and regularly placed within the mouth.

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Figure 1. Mold growth is evident on multiple areas of a DPI after 12 weeks of clinical use. Growth is seen on the top and undersurface of the inhaler cap (top panels) as well as in the device interior and at the base (middle panels). Culture of the debris revealed significant growth of *Candida parapsilosis* and *Cladosporium* species (bottom panels).

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