

What role does asthma medication have in ADHD or depression?

Faisal A. Islam, MD, MBA, and Zia Choudhry, MD, PhD, MBA

Dr. Islam is a postdoctoral fellow and psychopharmacologist, and Dr. Choudhry is a research mentor, Department of Mental Health and Clinical Research, International Maternal and Child Health Foundation, NPO, Montréal, Québec, Canada.

Disclosures

The authors report no financial relationships with any company whose products are mentioned in this article or with manufacturers of competing products.

Asthma medications comprise several drug classes, including leukotriene antagonists and steroid-based inhalers. These drugs have been implicated in behavioral changes, such as increased hyperactivity, similar to symptoms of attention-deficit/hyperactivity disorder (ADHD) and oppositional defiant disorder (ODD)¹; this scenario is more of a concern in children than adults. This raises the question of whether these medications are physiologically linked to behavioral symptoms because of a suggested association with serotonin.^{2,3} If this is the case, it is necessary to identify and evaluate possible psychiatric effects of these asthma agents.

How asthma medications work

Some asthma agents, such as montelukast, act as either leukotriene-related enzyme inhibitors (arachidonate 5-lipoxygenase) or leukotriene receptor antagonists. These drugs block production of inflammatory leukotrienes, which cause bronchoconstriction. Leukotrienes also can trigger cytokine synthesis, which can modulate leukotriene receptor function. Therefore, leukotriene antagonists could interfere with cytokine function.^{3,4}

Corticosteroid inhalers suppress inflammatory genes by reversing histone acetylation of inflammatory genes involved in asthma. These inhalers have been shown to reduce cytokine levels in patients with chronic lung disease and those with moderate to severe asthma.^{5,6} Corticosteroids also have been associated with a decrease in serotonin levels, which could contribute to depression.⁷

Possible link between asthma and serotonin

Serotonin plays an integral role in observable, dysfunctional behaviors seen in disorders such as ADHD and ODD. In previous studies, serotonin modulated the cytokine network, and patients with asthma had elevated levels of plasma serotonin.^{2,3} These findings imply that asthma medications could be involved in altering levels of both cytokines and serotonin. Pretorius² emphasized the importance of monitoring serotonin levels in children who exhibit behavioral dysfunction based on these observations:

- Persons with asthma presenting with medical symptoms have elevated serotonin levels.
- Decreased serotonin levels have been associated with ADHD and ODD; medications for ADHD have been shown to increase serotonin levels.
- Asthma medications have been shown to decrease serotonin levels.^{2,3}

Asthma medications might be partially responsible for behavioral disturbances, and therapeutic management should integrate the role of serotonin with asthma therapy.^{2,3}

Every issue of **CURRENT PSYCHIATRY** has its 'Pearls'

Yours could be found here.

Read the 'Pearls' guidelines for manuscript submission at CurrentPsychiatry.com, or request a copy from Assistant Editor Jason Orszat at jorszt@frontlinemedcom.com. Then, share with your peers a 'Pearl' of wisdom from your years of practice.

Clinical considerations

Therapeutic management of asthma should consider psychiatric conditions and treatments. Future research should investigate the overall predisposition for behavioral dysfunction in persons with respiratory syncytial virus, a precursor for asthma. Once an asthma patient's risk of a psychiatric disorder has been identified, the clinician can determine the most effective medications for treating the condition. If potential medications or genetic or environmental factors are identified, we might expect a move toward personalized care in the not too distant future.

References

1. Saricoban HE, Ozen A, Harmanci K, et al. Common behavioral problems among children with asthma: is there a role of asthma treatment? *Ann Allergy Asthma Immunol.* 2011;106(3):200-204.
2. Pretorius E. Asthma medication may influence the psychological functioning of children. *Med Hypotheses.* 2004;63(3):409-413.
3. Ménard G, Turmei V, Bissonnette EY. Serotonin modulates the cytokine network in the lung: involvement of prostaglandin E2. *Clin Exp Immunol.* 2007;150(2):340-348.
4. Rola-Pleszczynski M, Stankova J. Cytokine-leukotriene receptor interactions. *Scientific World Journal.* 2007;7:1348-1358.
5. Kaur M, Reynolds S, Smyth LJ, et al. The effects of corticosteroids on cytokine production from asthma lung lymphocytes. *Int Immunopharmacol.* 2014;23(2):581-584.
6. Honda R, Ichiyama T, Sunagawa S, et al. Inhaled corticosteroid therapy reduces cytokine levels in sputum from very preterm infants with chronic lung disease. *Acta Paediatr.* 2009;98(1):118-122.
7. Pretorius E. Corticosteroids, depression and the role of serotonin. *Rev Neurosci.* 2004;15(2):109-116.

Corticosteroids have been associated with a decrease in serotonin, which could contribute to depression