

Has Aerobic Exercise Anti-inflammatory Effects for Asthma?

Rodolfo de Paula Vieira*

Post Graduate Program in Biophotonics Applied to Health Sciences, Nove de Julho University, São Paulo, SP, Brazil

One of the first studies available in the literature that can be considered as an embryonic concept of pulmonary rehabilitation (PR) was performed by Livingstone and Gillespie in 1935 [1]. In this study, the authors applied respiratory exercises to asthmatic patients, aiming to increase the chest mobility [1]. However, until the middle of 20's century the concept of PR did not exist and the treatment was exclusively pharmacological [2].

The concept of pulmonary rehabilitation including the practice of aerobic exercise training began to emerge from the 50's, but until few years ago, the practice of exercises by asthmatic individuals was considered as irresponsibility and strongly discouraged, because asthmatics could present bronchospasm induced by exercise (BIE) [3].

On the other hand, actually, asthmatic patients are strongly encouraged to be involved in pulmonary rehabilitation programs, according to the statements of American Association of Cardiovascular & Pulmonary Rehabilitation [4,5]. This gradual change of concept represents a big advance against old paradigms, and is based in a growing number of clinical and experimental studies showing that the regular practice of aerobic exercises in appropriate volume and intensity results in several physical and psychological beneficial effects to asthmatic patients [5-15].

Compelling evidences point out to a role of aerobic exercise training in asthma physiopathology and disease control. Asthmatic patients submitted to appropriate rehabilitation program including low to moderate intensity aerobic exercise present an improvement in lung function (e.g. increase in ventilatory capacity) and asthma-related symptoms "asthma-control" (e.g. dyspnea, exercise-induced bronchospasm or peak expiratory flow variability) [5-15]. In addition a decrease of daily use of inhaled steroids has been reported, suggesting an anti-inflammatory effect of exercise on asthmatic lungs [5-15]. This hypothesis was further supported by recent findings from Gonçalves et al. and Mendes et al., demonstrating that aerobic exercise decreased the levels of exhaled nitric oxide, an established pro-inflammatory mediator in asthma, and also the number of eosinophils in induced sputum in moderate/severe persistent asthmatic patients [13,14].

In this direction, since 2004 a growing number of experimental studies using mouse models of chronic allergic airway inflammation have demonstrated that low and moderate intensity aerobic exercise performed either before, during or after the allergen sensitization results in decreased eosinophilic inflammation, Th2 cytokines production, airway remodeling and hyperresponsiveness [16-24]. Shortly, these studies have demonstrated that these beneficial effects can be attributed to decreased activation of leukocytes and bronchial epithelial cells as a result of increased activation of glucocorticoids receptors, T-regulatory cells resulting in increased synthesis of anti-inflammatory cytokine IL-10, and decreased activation of transcriptional factor NF- κ B [16-24]. In addition, these studies also demonstrated that aerobic exercise present a direct inhibitory effect on the pulmonary oxidants production as well as on the synthesis of mediators involved in the airway remodeling process [19,24]. However, the precise cellular and molecular mechanisms of beneficial effects of aerobic exercise for asthma deserve further investigations.

More recently, an excellent study from Mendes et al. demonstrated for the first time that 12 weeks of moderate intensity aerobic exercise in moderate and severe asthmatic patients resulted in decreased number of eosinophils in induced sputum, proving the concept that aerobic exercise presents anti-inflammatory effects for asthma [14].

Therefore, we conclude that aerobic exercise present anti-inflammatory effects for asthma and we could affirm that a new exciting research field is now open and claiming for more investigation regarding the effects of aerobic exercise for asthma.

References

1. Livingstone JL, Gillespie M (1935) Value of breathing exercises in asthma. *Lancet* 2: 705.
2. PEARSON RS (1950) The management of asthma. *Br Med J* 1: 1311-1314.
3. Disabella V, Sherman C (1998) Exercise for asthma patients: little risk, big rewards. *Phys Sportsmed* 26: 75-84.
4. American Association of Cardiovascular & Pulmonary Rehabilitation (1998) Guidelines of Pulmonary Rehabilitation Programmes. (2nd edn), Human Kinetics Publishers, Champaign, Illinois, USA.
5. Ram FS, Robinson SM, Black PN, Picot J (2005) Physical training for asthma. *Cochrane Database Syst Rev* CD001116.
6. Engström I, Fällström K, Karlberg E, Sten G, Bjure J (1991) Psychological and respiratory physiological effects of a physical exercise programme on boys with severe asthma. *Acta Paediatr Scand* 80: 1058-1065.
7. Huang SW, Veiga R, Sila U, Reed E, Hines S (1989) The effect of swimming in asthmatic children--participants in a swimming program in the city of Baltimore. *J Asthma* 26: 117-121.
8. Ramazanoglu YM, Kraemer R (1985) Cardiorespiratory response to physical conditioning in children with bronchial asthma. *Pediatr Pulmonol* 1: 272-277.
9. Szentágothai K, Gyene I, Szócska M, Osváth P (1987) Physical exercise program for children with bronchial asthma. *Pediatr Pulmonol* 3: 166-172.
10. Neder JA, Nery LE, Silva AC, Cabral AL, Fernandes AL (1999) Short-term effects of aerobic training in the clinical management of moderate to severe asthma in children. *Thorax* 54: 202-206.
11. Fanelli A, Cabral AL, Neder JA, Martins MA, Carvalho CR (2007) Exercise training on disease control and quality of life in asthmatic children. *Med Sci Sports Exerc* 39: 1474-1480.
12. Moreira A, Delgado L, Haahtela T, Fonseca J, Moreira P, et al. (2008) Physical training does not increase allergic inflammation in asthmatic children. *Eur Respir J* 32: 1570-1575.
13. Gonçalves RC, Nunes MPT, Cukier A, Stelmach R, Martins MA, et al. (2008) Effects of an aerobic physical training program on psychosocial characteristics,

*Corresponding author: Rodolfo de Paula Vieira, Post Graduate Program in Biophotonics Applied to Health Sciences, Nove de Julho University, São Paulo, SP, Brazil, Tel: 55-12-3626-5609; E-mail: rodrelena@yahoo.com.br

Received February 11, 2012; Accepted February 11, 2012; Published February 13, 2012

Citation: Vieira RP (2012) Has Aerobic Exercise Anti-inflammatory Effects for Asthma? *J Nov Physiother* 2:e108. doi:10.4172/2165-7025.1000e108

Copyright: © 2012 Vieira RP. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

- quality-of-life, symptoms and exhaled nitric oxide in individuals with moderate or severe persistent asthma. *Rev Bras Fisioter* 12: 127-135.
14. Mendes FA, Almeida FM, Cukier A, Stelmach R, Jacob-Filho W, et al. (2011) Effects of aerobic training on airway inflammation in asthmatic patients. *Med Sci Sports Exerc* 43: 197-203.
 15. Mendes FA, Gonçalves RC, Nunes MP, Saraiva-Romanholo BM, Cukier A, et al. (2010) Effects of aerobic training on psychosocial morbidity and symptoms in patients with asthma: a randomized clinical trial. *Chest* 138: 331-337.
 16. Pastva A, Estell K, Schoeb TR, Atkinson TP, Schwiebert LM (2004) Aerobic exercise attenuates airway inflammatory responses in a mouse model of atopic asthma. *J Immunol* 172: 4520-4526.
 17. Pastva A, Estell K, Schoeb TR, Schwiebert LM (2005) RU486 blocks the anti-inflammatory effects of exercise in a murine model of allergen-induced pulmonary inflammation. *Brain Behav Immun* 19: 413-422.
 18. Vieira RP, Claudino RC, Duarte AC, Santos AB, Perini A, et al. (2007) Aerobic exercise decreases chronic allergic lung inflammation and airway remodeling in mice. *Am J Respir Crit Care Med* 176: 871-877.
 19. Vieira RP, de Andrade VF, Duarte AC, Dos Santos AB, Mauad T, et al. (2008) Aerobic conditioning and allergic pulmonary inflammation in mice. II. Effects on lung vascular and parenchymal inflammation and remodeling. *Am J Physiol Lung Cell Mol Physiol* 295: L670-679.
 20. Hewitt M, Creel A, Estell K, Davis IC, Schwiebert LM (2009) Acute exercise decreases airway inflammation, but not responsiveness, in an allergic asthma model. *Am J Respir Cell Mol Biol* 40: 83-89.
 21. Hewitt M, Estell K, Davis IC, Schwiebert LM (2010) Repeated bouts of moderate-intensity aerobic exercise reduce airway reactivity in a murine asthma model. *Am J Respir Cell Mol Biol* 42: 243-249.
 22. Silva RA, Vieira RP, Duarte AC, Lopes FD, Perini A, et al. (2010) Aerobic training reverses airway inflammation and remodelling in an asthma murine model. *Eur Respir J* 35: 994-1002.
 23. Lowder T, Dugger K, Deshane J, Estell K, Schwiebert LM (2010) Repeated bouts of aerobic exercise enhance regulatory T cell responses in a murine asthma model. *Brain Behav Immun* 24: 153-159.
 24. Vieira RP, Toledo AC, Ferreira SC, Santos AB, Medeiros MC, et al. (2011) Airway epithelium mediates the anti-inflammatory effects of exercise on asthma. *Respir Physiol Neurobiol* 175: 383-389.

Submit your next manuscript and get advantages of OMICS Group submissions

Unique features:

- User friendly/feasible website-translation of your paper to 50 world's leading languages
- Audio Version of published paper
- Digital articles to share and explore

Special features:

- 200 Open Access Journals
- 15,000 editorial team
- 21 days rapid review process
- Quality and quick editorial, review and publication processing
- Indexing at PubMed (partial), Scopus, DOAJ, EBSCO, Index Copernicus and Google Scholar etc
- Sharing Option: Social Networking Enabled
- Authors, Reviewers and Editors rewarded with online Scientific Credits
- Better discount for your subsequent articles

Submit your manuscript at: <http://www.omicsonline.org/submission/>

