- 14 **Bolser DC**, Reier PJ. Inspiratory and expiratory patterns of the pectoralis major muscle during pulmonary defensive reflexes. *J Appl Physiol* 1998;**85**:1786–92.
- 15 **Bolser DC**, Reier PJ, Davenport PW. Responses of the anterolateral abdominal muscles during cough and expiratory threshold loading in the cat. *J Appl Physiol* 2000;**88**:1207–14.
- 16 **Poliaček I**, Stránský A, Jaku J, *et al*. Activity of the laryngeal abductor and adductor muscles during cough, expiration and aspiration reflexes in cats. *Physiol Res* 2003;**52**:749–62.
- 17 **Iscoe S**. Control of abdominal muscles. *Prog Neurobiol* 1998;**56**:433–506.
- 18 **Strohl K**, Mead J, Banzett R, *et al*. Regional differences in abdominal muscle activity during various manoeuvres in humans. *J Appl Physiol: Respirat Environ Exerc Physiol* 1981;**51**:1471–6.
- 19 **Goldman JM**, Lehr RP, Millar AB, *et al*. An electromyographic study of the abdominal muscles during postural and respiratory maneuvers. *J Neurol Neurosurg Psychiatry* 1987;**50**:866–96.
- 20 **Fontana GA**, Pantaleo T, Lavorini F, *et al*. Defective motor control of coughing in Parkinson's disease. *Am J Respir Crit Care Med* 1998;**158**:458–64.
- 21 **Cox ID**, Wallis PJ, Apps MC, *et al*. An electromyographic method of objectively assessing cough intensity and use of the method to assess effects of codeine on the dose-response curve to citric acid. *Br J Clin Pharmacol* 1984;**18**:377–82.
- 22 **Estenne M**, De Troyer A. Cough in tetraplegic subjects: an active process. *Ann Intern Med* 1990;**112**:22–8.
- 23 **Fujiwara T**, Hara Y, Chino N. Expiratory function in complete tetraplegics: Study of spirometry, maximal expiratory pressure, and muscle activity of pectoralis major and latissimus dorsi muscles. *Am J Phys Med Rehabil* 1999;**78**:464–9.
- 24 **Irwin RS**, Boulet LP, Cloutier MM, *et al*. Managing cough as a defense mechanism and a symptom. A consensus panel report of the American College of Chest Physicians. *Chest* 1998;**114**(Suppl 2):133–81S.
- 25 **Addington WR**, Stephens RE, Widdicombe JG, *et al*. Electrophysiologic latency to the external obliques of the laryngeal cough expiration reflex in humans. *Am J Phys Med Rehabil* 2003;**82**:370–3.
- 26 **Stephens RE**, Addington WR, Widdicombe JG. Effect of unilateral middle cerebral artery infarcts on voluntary cough and the laryngeal cough reflex. *Am J Phys Med Rehabil* 2003;**82**:379–83.
- 27 **Niimi A**, Matsumoto H, Ueda T, *et al*. Impaired cough reflex in patients with recurrent pneumonia. *Thorax* 2003;**58**:152–3.
- 28 **Bolser DC**, Davenport PW. Functional organisation of the central cough generation mechanism. *Pulm Pharmacol Ther* 2002;**15**:221–5.
- 29 **Chan CLH**, Ponsford S, Swash M. The anal reflex elicited by cough and sniff: validation of a neglected clinical sign. *J Neural Neurosurg Psychiatry* 2004;**75**:1449–51.
- 30 **Prudon B**, Birring SS, Vara DD, *et al*. Cough and glottic-stop reflex sensitivity in health and disease. *Chest* 2005;**127**:550–7.
- 31 **Fontana GA**, Pantaleo T, Lavorini F, *et al*. A noninvasive electromyographic study on threshold and intensity of cough in humans. *Eur Respir J* 1997;**10**:983–9.
- 32 **Marik PE**, Kaplan D. Aspiration pneumonia and dysphagia in the elderly. *Chest* 2003;**124**:328–36.
- 33 **Hilker R**, Poetter C, Findeisen N, *et al*. Nosocomial pneumonia after acute stroke: implications for neurological intensive care medicine. *Stroke* 2003;**34**:975–81.
- 34 **Taylor P**, Tromans A, Harris K, *et al*. Electrical stimulation of abdominal muscles for control of blood pressure and augmentation of cough in a C3/4 level tetraplegic. *Spinal Cord* 2002;**40**:34–6.

LUNG ALERT

Potential role of *Cryptococcus neoformans* in the pathogenesis of asthma

▲ Goldman DL, Davis J, Bommarito F, *et al*. Enhanced allergic inflammation and airway responsiveness in rats with chronic *Cryptococcus neoformans* infection: potential role for fungal pulmonary infection in the pathogenesis of asthma. *J Infect Dis* 2006;**193**:1178–86

The potential of pulmonary *Cryptococcus neoformans* infection in immunocompetent subjects to modify allergic inflammation and airway responsiveness was investigated using a rat model.

Rats were inoculated with *C. neoformans* either endotracheally or intravenously. Four modes of infection were studied: short term and persistent localised pulmonary infection, resolved pulmonary infection, and disseminated systemic infection. All were subsequently sensitised and challenged with ovalbumin.

Compared with controls and experimental subjects before sensitisation, only the disseminated infection mode had a higher IgE titre. All active infections had higher bronchoalveolar lavage (BAL) eosinophil counts. After sensitisation and challenge, IgE titre and BAL cell count generally increased. However, when compared with controls, only active localised pulmonary infections showed higher serum titres of total and ovalbumin specific IgE, as well as higher BAL eosinophil counts. Baseline airway resistance did not differ between infected and uninfected rats. However, regardless of sensitisation status, short term pulmonary infected rats had higher airway responsiveness. All forms of active infection expressed increased interleukin (IL)-13, IL-10, and tumour necrosis factor α without any detectable IL-4 or IL-12. Localised infection was associated with higher IL-13 expression than disseminated infection. Furthermore, disseminated (but not localised) infection was associated with an increased level of interferon- γ .

The authors concluded that active pulmonary cryptococcal infection may enhance allergic response with Th2 polarisation and increased airway responsiveness in rats. They suggested that epidemiological studies are warranted to explore the potential contribution of subclinical cryptococcal infection to the high prevalence of urban asthma.

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