

## Steroid-induced hyperglycaemia and pulmonary disease

Chakrabarti and colleagues recently reported that hyperglycaemia within 24 h of admission could be used as a predictor of outcome during non-invasive ventilation in decompensated chronic obstructive pulmonary disease (COPD).<sup>1</sup> Hyperglycaemia was unrelated to prior oral corticosteroid use in this study, but duration of steroid preceding admission was not reported. Furthermore, as this group included only 18 patients it would be insufficiently powered to detect a modest rise in glucose. Doctors are vigilant to the occasional patient who develops symptomatic hyperglycaemia whilst taking steroids, but are less attentive to small changes in glucose. Li *et al* recorded complications of steroid treatment in a cohort of 1291 patients with SARS (severe acute respiratory syndrome) of whom 1084 (84%) were treated with methylprednisolone while 207 (16%) received no steroid treatment.<sup>2</sup> Glucose levels were the same at baseline in both groups but in those treated with steroid the mean value rose significantly. The highest blood glucose in the methylprednisolone group was 8.68 mmol/l ( $\pm 4.8$ ) compared with 6.39 mmol/l ( $\pm 3.71$ ) in the non-steroid cohort ( $p < 0.05$ ).<sup>2</sup> This change is comparable with the 1.8 mmol/l increase observed with hydrocortisone in a multicentre randomised trial of steroids in sepsis.<sup>3</sup>

An increase of this magnitude appears trivial, but significantly alters glucose levels within the lung. Airway surface fluid is a key element of pulmonary defence, and glucose is normally maintained 3–20 times lower than plasma levels by active transport mechanisms.<sup>4</sup> The latter has a threshold of 6.7–9.7 mmol/l and glucose increases in airway fluid when plasma levels exceed this value. Furthermore, pulmonary inflammation disrupts epithelial integrity and also leads to a rise in lung glucose. Airway surface fluid contains surfactant proteins A and D, which not only are important host defence molecules against a broad spectrum of pathogens but, in addition, possess a number of immunoregulatory properties. These proteins are members of the collectin family, which recognise carbohydrate moieties on microorganisms through their lectin domain. The latter also binds glucose, which may act as a competitive inhibitor of surfactant proteins.<sup>5</sup> It is little surprise, therefore, that raised airway fluid glucose promotes pulmonary inflammation and infection.<sup>4</sup>

Corticosteroids are an important treatment modality in many pulmonary and extrapulmonary diseases. It is likely that in many diseases such as COPD, interstitial lung disease and asthma, modest hyperglycaemia associated with steroid use abrogates the beneficial anti-inflammatory effects of these drugs. Further investigation of this phenomenon is warranted not only in

COPD, but also in other pulmonary diseases in which steroids are commonly used.

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## REFERENCES

1. **Chakrabarti B**, Angus RM, Agarwal S, *et al*. Hyperglycaemia as a predictor of outcome during non-invasive ventilation in decompensated COPD. *Thorax* 2009;**64**:857–62.
2. **Li N**, Wang GF, Wu YF, *et al*. Side effects of glucocorticosteroids in the management of 1291 patients with SARS. *Beijing Da Xue Xue Bao* 2004;**36**:519–24.
3. **Annane D**, Sebille V, Bellissant E. Corticosteroids for patients with septic shock. *JAMA* 2003;**289**:43–4.
4. **Baker EH**, Wood DM, Brennan AL, *et al*. Hyperglycaemia and pulmonary infection. *Proc Nutr Soc* 2006;**65**:227–35.
5. **Reading PC**, Allison J, Crouch EC, *et al*. Increased susceptibility of diabetic mice to influenza virus infection: compromise of collectin-mediated host defence of the lung by glucose? *J Virol* 1998;**72**:6884–7.