Local control of blood flow in lungs of the Coati mundi

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The Coati mundi (*Nasua nasua*) is a small mammal, indigenous to Central and Southern America. The lungs of Coatis lack the communications which in other species (dog, cat and man) allow collateral gas flow between neighbouring lobules within a lobe (J. Mead, personal communication). The Coati mundi is a convenient size (2·5–5·0 kg, body weight) for studies in the intact lung of the gas-exchange behaviour of small lung units.

The animals were anaesthetized with 1% chloralose and 10% urethane, and placed supine in a plethysmograph with a cannula from a tracheostomy leading to the outside. Breathing was spontaneous. A catheter (80 cm in length, 0·14 cm i.d.) with a bell-shaped tip (0·29–0·35 cm o.d.) was passed down the trachea until it wedged in a bronchus supplying 5–10 secondary lobules of the right or left lower lobe. An inner catheter (0·06 cm o.d.) supplied inspired gas for the lobules at a constant flow rate. Lobule tidal volume was recorded from a miniature spirometer. The mixed expired gas from the lobule (or the lung) was sampled continuously with a mass spectrometer (modified MS 4) and the mean oxygen, carbon dioxide and nitrogen concentrations and respiratory exchange ratio (R) recorded for each 6 sec period.

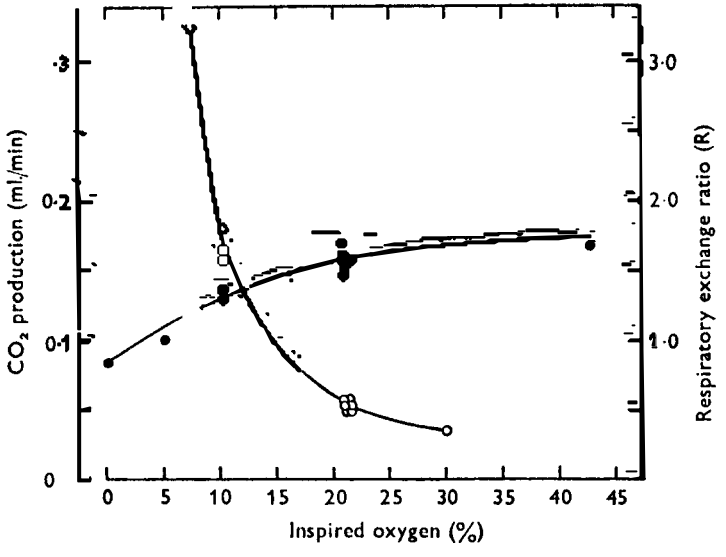

Fig. 1. Lobule CO_2 production (●) ml./min STPD, and respiratory exchange ratio (○) plotted against inspired oxygen concentration. There was no CO_2 in the inspired gas.

Fig. 1 shows an experiment where the inspired oxygen concentration to the lobule was varied from 43% to zero. During this period overall alveolar ventilation (325–440 ml./min) lung R (0·7–0·78), CO_2 production (11·9–12·9 ml./min), arterial P_{O_2} (101–107 Torr) and the composition of the mixed venous blood remained reasonably constant. Lobule alveolar ventilation varied (4·4–5·7 ml./min), but not systematically with O_2 concentration nor enough to account for the observed changes in lobule $\dot{V}_{CO_2}$ or R. Raising inspired CO_2 to 8% with constant inspired O_2, reduced lobule $\dot{V}_{O_2}$. Since these lobules formed less than 1% of the lung these observations suggest

that local adjustments of blood flow occur with changes in lobule P_{O_2} and P_{CO_2} – a control mechanism proposed by von Euler & Liljestrand (1946).

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REFERENCE

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Energy metabolism during exercise after fenfluramine

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The contribution of leg (muscle plus bone) volume to maximum aerobic power output: the effects of anaemia, malnutrition and physical activity

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In a recent series of publications (see Davies, Mbelwa, Crockford & Weiner (1973) for a general review) the close association of maximum aerobic power output ($\dot{V}_{O_2\,max}$) with estimates of leg (muscle plus bone) volume (L.V.) (see Jones & Pearson, 1969), has been demonstrated in children and young healthy adults.

In this communication the relationship of $\dot{V}_{O_2,\,max}$ to L.V. has been analysed in East African children suffering from malnutrition (using the clinical and anthropometric criteria of Jelliffe (1966) and severe iron-deficiency anaemia (Hb < 8·5 g/100 ml.) and in a group of rural adult East Africans engaged in prolonged active daily work. The data have been compared to 'normal' East Africans aged 7–35 years.

The results show that the association of $\dot{V}_{O_2,\,max}$ with L.V. is not causal, the effects of increased habitual activity and anaemia on $\dot{V}_{O_2,\,max}$ are independent of L.V., the former being additive and the latter multiplicative. Further, oral iron therapy produces an increase in $\dot{V}_{O_2,\,max}$ in anaemic subjects towards normal values without a concomitant change in L.V. In malnutrition, however, the relationship of $\dot{V}_{O_2,\,max}$ to L.V. remains unchanged: $\dot{V}_{O_2,\,max}$ decreases *pari passu* with the reduced leg (muscle plus bone) volume.

The analysis gives a clearer understanding of the relationship between 'active' muscle mass and aerobic power output on the bicycle ergometer and suggests that estimates of L.V. may not be used to predict $\dot{V}_{O_2,\,max}$ directly, in populations where the level of habitual activity and disease patterns are unknown. Nevertheless the data could serve as a basis for