Transit time and ratio of moments

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Transit Time and Ratio of Moments

THE EDITOR,
Sir,

In correspondence on this topic (Orr, Myers, Leeman and Hughes 1978) we found difficulty in understanding the definition of their constants A_1 and A_2. These are defined by the local count rate observed over a region of lung consisting of two parallel compartments viewed simultaneously after equilibrium being $A_1 \exp(-\lambda_1 t) + A_2 \exp(-\lambda_2 t)$, normalised so that $A_1 + A_2 = 1$. We find this normalisation physically confusing, since one expects a count rate to have some units. In fact, the authors themselves in a later example give values of 6000 and 1400 for A_1 and A_2 respectively (along with dimensionless values for λ, the rate constant). We suggest that a clearer and more practical definition would be to leave the A's unnormalised, so that the original equations become, for washout after equilibrium,

$$\text{average specific ventilation} = \frac{A_1\lambda_1 + A_2\lambda_2}{A_1 + A_2} \tag{1}$$

$$\text{mean transit time} = \frac{A_1 + A_2}{A_1\lambda_1 + A_2\lambda_2}. \tag{2}$$

For a bolus input, when the count rate over a region of the lung is

$$B_1 \exp(-\lambda_1 t) + B_2 \exp(-\lambda_2 t),$$

we have

$$\text{mean transit time} = \frac{B_1\lambda_2 + B_2\lambda_1}{(B_1 + B_2)\lambda_1\lambda_2} \tag{3}$$

Their quoted experimental values may then be substituted directly into these equations to give numerically and dimensionally correct values for the transit times.

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REFERENCE

ORR, J. S., MYERS, M. J., LEEMAN, S., and HUGHES, J. M. B., 1978, *Phys. Med. Biol.*, **23**, 998.

The Application of Transform Methods to Hippuran Renograms

THE EDITOR,
Sir,

Apart from the error in eqn (3),† I agree with the letter by Chackett (1978). I think the difference between his treatment and mine is that he tries to tailor

† See Corrigendum page 456.