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APPENDIX

Calculation of Rate of Exchange Transamination

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The problem was to determine the rate of exchange transamination between glutamate and α-oxoglutarate when the situation was complicated by a net conversion of glutamate into α-oxoglutarate and by the continuous utilization of α-oxoglutarate.

The diagram shown in Scheme 1 is a simplification of what occurred when the above substrates were incubated with tissue preparations. The following simplifications were made:

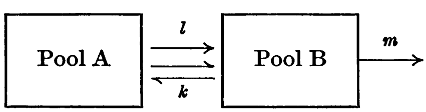
(i) Net glutamate removal only occurred via its conversion into α-oxoglutarate.

(ii) Pools A and B were homogeneous.

(iii) The rates k, l and m were constant and independent of the amounts of substrate within the ranges studied.

Rate of change in size of pool A:

$$\frac{da}{dt} = -l \tag{1}$$



	Pool A (glutamate)	Pool B (α-oxoglutarate)
Amount of substrate... ...	a	b
Radioactivity...	x	y
Specific activity	x/a	y/b

Scheme 1. k, Rate of exchange transamination; l, net rate of removal of glutamate; m, rate of removal of α-oxoglutarate, calculated as the net decrease in glutamate + α-oxoglutarate.

Rate of change in size of pool B:

$$\frac{db}{dt} = l - m \tag{2}$$

Rate of change in radioactivity of pool A:

$$\frac{dx}{dt} = \frac{ky}{b} - (k+l)\frac{x}{a} \tag{3}$$

Rate of change in radioactivity of pool B:

$$\frac{dy}{dt} = (k+l)\frac{x}{a} - (k+m)\frac{y}{b} \tag{4}$$

From eqns. (1) and (2):

$$l = \frac{a_0 - a}{t}$$

$$m = l + \frac{b_0 - b}{t}$$

The effect of experimental error was minimized by estimating the values of a and b from regression lines; hence l and m were determined (Table 3 of Balázs & Haslam, 1965).

An Elliott 803 computer was used to integrate the four simultaneous differential equations and to give values for x and y at time t. The Runge–Kutta–Merson method of integration was employed (Lance, 1960) and the integration was repeated with various values of k.

The specific activity of each pool was plotted against time for both the experimental results and for the values calculated from the various estimates of k (Fig. 1 of Balázs & Haslam, 1965). These graphs enable a best estimate of k to be made.

REFERENCES

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