Details of a simple modification of Money & Dancis' preparation have been described (Reynolds & Young, 1971). Briefly, the near term mother was anaesthetized with pentobarbitone sodium (Nembutal, 20–30 mg/kg) and supported in a saline bath at 38° C. The foetus was exteriorized by Caesarian section, the umbilical arteries and vein cannulated and the foetus removed; the maternal circulation to the placenta remained intact. The placenta was perfused with a physiological solution containing 6·5% dextran (Lomodex) at 2 ml/min and at a pressure of 34–40 mmHg which is equal to that measured in the umbilical artery of the intact foetus.

Maternal acid base balance and carotid arterial blood pressure were monitored throughout each experiment. Constant infusions were maintained, via the maternal jugular vein, of: (1) metaraminol (Aramine) to maintain and steady the maternal arterial pressure and placental circulation, and (2) of antipyrine (Phenazone) to monitor changes in the maternal placental blood flow. When the maternal arterial pressure and acid base balance were within the normal ranges, there was close agreement between the perfusate and maternal plasma concentrations of antipyrine; in a poor preparation or following maternal haemorrhage, there was a reduction in the antipyrine transfer (Reynolds & Young, 1971). Therefore, the transfer of antipyrine may be used as an index of maternal placental blood flow, and to determine whether the pharmacological effect of a drug on the transfer of another substance is direct, or mediated by changes in the maternal placental circulation. Antipyrine transfer itself is an example of the rapid diffusion of an antipyretic drug across the placenta. The net transfer and bi-directional flux of a pharmacological substance may be studied since the composition of the perfusion fluid is readily changed and a new steady state established.

The structure of the placental membrane separating the maternal and foetal blood in the guinea-pig is similar to that in the human (Enders, 1965). As an experimental animal, the guinea-pig is comparatively cheap and readily available in the pregnant state, though the gestation is 67 days. The small blood volume also allows economic use of the pharmacological agent being studied.

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Kinetic analysis of amino acid uptake by the rat retina *in vitro*

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Amino acids are actively taken up into brain tissue, as into other tissues, by several relatively non-specific uptake processes (Blasberg, 1967). Recently, it has been demonstrated that central nervous tissues also possess specific, high affinity, uptake processes for certain amino acids (e.g. GABA, glutamate, taurine, glycine) and it has been suggested that the presence of such an uptake process could be associated with a neurotransmitter role of the amino acid (Logan & Snyder, 1972).

In the present study, we have examined the retinal uptake of various amino acids, over wide concentration ranges, and have subjected the results to kinetic analysis using several different procedures.

The results of such studies can often be interpreted phenomenologically in terms of the Michaelis-Menten equation. Linear, and non-linear fits to this equation have been made using both established, and also novel computer programs written in Fortran IV and run on the University of London CDC 6600 computer. Graphs of three linear transforms of the Michaelis-Menten equation have also been constructed using a CalComp incremental graph plotting machine.

In addition, a study has been made in order to determine the components of the experimental variance, and the extent of their contribution to the results has been assessed. Kinetic analysis indicated that the uptake of all the amino acids exhibited non-linearity when plotted according to the various linear transforms of the Michaelis-Menten equation, and showed both low and high affinity components (Table 1).

TABLE 1. *Apparent Km values (μM) for amino acid uptake by the retina. Tissue was incubated with the labelled amino acids for 5 min. and the accumulation of radioactivity was used to obtain estimates of the initial velocity. Nine concentrations of amino acid were used to construct each plot (Lineweaver-Burk) and each point was the mean of 6–12 determinations*

Amino acid	Km_1	Km_2
Taurine	27	537
GABA	47	241
L-Aspartate	26	687
L-Glutamate	21	617
Glycine	7	1093
L-Alanine	13	440
L-Valine	119	403

The results obtained from these graphical methods have been compared with those computed from non-linear iterative fitting procedures assuming either one or two component uptake systems corresponding to the equations:

$$v = \frac{Vmax.\,S}{Km + S} \text{ and } v = \frac{V_1max.\,S}{Km_1 + S} + \frac{V_2max.\,S}{Km_2 + S} \text{ respectively.}$$

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A theoretical model of ion-movements in micropipettes occurring during the course of microelectrophoresis experiments

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We have found that both parameters (intensity and time of application) of a prior retaining current are important in influencing the time-course of neuronal responses to microelectrophoretically applied drugs. Measurement of the amount of drug released by an ejecting current after the application of a retaining current suggested that retaining currents interfere with the kinetics of drug release (Bradshaw, Roberts & Szabadi, 1973). We demonstrate a theoretical model in an attempt to explain these experimental findings.

When the tip of a micropipette is immersed in an external medium (collecting fluid, brain tissue), a concentration gradient is set up between the drug solution and the