REFERENCES

- COLLINS, TREACHER (1926).—*Trans. Ophthalm. Soc. U.K.*, **46**, 86.
 DAWSON (1925).—*Edin. Med. J.*, **32**, 501.
 LAWRENCE and JOHNSON (1915).—*Choyce's Surgery*, **1**, 454, London.
 MANN, IDA (1926).—*Trans. Ophthalm. Soc. U.K.*, **46**, 132.
 MASSON (1926).—*Ann. d'Anat. Path.*, **3**, 417; 657.
 PARSONS, J. H. (1904).—*Pathology of the Eye*, London.
 RIBBERT, H. (1911).—*Lehrbuch alg. Pathologie*, **4**, 262.
 SMITH, D. T. (1925).—*Bull. Johns Hopkins Hosp.*, **36**, 185.
 THEOBALD, G. D. (1937).—*Arch. of Ophthalm.*, **18**, 971.
 UNNA, P. G. (1893).—*Berl. Kl. Wochenschr.*, **30**, 14.
 WILLIS, R. A. (1948).—*Pathology of Tumours*, 828, London.
 WOLFF, EUGENE (1948).—*Brit. J. Ophthalm.*, **32**, 72.
 ——— (1948).—*Trans. Ophthalm. Soc. U.K.*, **68** (in the press).

STUDIES ON THE INTRA-OCULAR FLUIDS

Part 3.—The Penetration of Some Nitrogenous Substances into the Intra-ocular Fluids.*

BY

SIR STEWART DUKE-ELDER, HUGH DAVSON,

and

A. M. WOODIN

*Ophthalmological Research Unit (M.R.C.)
 Institute of Ophthalmology, London.*

EXPERIMENTS on the rate of penetration of sugars (Duke-Elder and Davson, 1949) and salts (Duke-Elder, Davson and Maurice, 1949) from the blood into the intra-ocular fluids reported earlier in this series have revealed a selectivity in the barrier separating these fluids, inconsistent with the conception of penetration through a simple pore-structure such as would be provided by the intercellular spaces of an endothelial or epithelial membrane. We were forced to conclude, on the basis of these studies, that the penetration of many substances into the intra-ocular fluids represented a trans-cellular process since it is only in the membranes of cells that we can expect to find a selectivity of the type described (Davson and Danielli, 1942). Experiments on the penetration of some amino-compounds—creatinine, urea, glycine, and alanine—to be described here, support this view. The above-named compounds have the following molecular weights:—

Creatinine, 113
 Urea, 60

Glycine, 75
 Alanine, 89

Dedicated to Professor J. Meller.

* These experiments were carried out by E. J. Ross working in this laboratory: see *Brit. J. Ophthalm.*, **33**; p. 310. Received for publication, March 12, 1949.

METHODS

The general methods of raising the blood concentration of the substance studied have been described earlier (Duke-Elder and Davson, 1949): in all cases the renal arteries were tied to prevent too rapid an elimination of the injected material.

Chemical. Urea was determined by the method of Conway (1947); amino-acids by the Danielson (1933) modification of the Folin-Wu (1919) method on tungstic acid filtrates, and creatinine by the Folin (1905) method on similar filtrates.

RESULTS

The results are shown in Table I, the parameters K'_A and K'_V indicating the relative rates of penetration into the aqueous humour and vitreous body respectively.

TABLE I

Substance	No. of Expts.	100 K'_A	100 K'_V	K'_A/K'_V
Creatinine	8	12.9 ± 1.2	0.79 ± 0.13	16
Urea	12	14.0 ± 0.9	7.0 ± 1.2	2
Glycine	3	15.5 ± 2.3	0.6 ± 0.5	26
Alanine	5	13.3 ± 2.4	1.0 ± 0.5	13

It will be noted that the rates of penetration of these substances into the aqueous humour are not significantly different, being in the region of 13 to 15: the rate of penetration into the vitreous body, however, is very much slower, and among these substances urea stands out from the other compounds studied in entering very much more quickly, showing a value for K'_V of 7 as against values in the region of unity.

DISCUSSION

It may be noted that the nitrogenous substances considered here pass from the blood into the aqueous humour slowly and with apparent difficulty. It is interesting and important that they do so at considerably lower rates than the monosaccharides (K'_A 32.5) (Duke-Elder and Davson, 1949) and sodium (K'_A 37.6) (Duke-Elder, Davson and Maurice, 1949). Urea, for example, with a molecular weight of only 60, penetrates at about half the rate of glucose which has a molecular weight of 180. It is obvious that on the basis of a process of transfusion through a simple pore-structure (as occurs in most tissues of the body) the rate of penetration of urea should be considerably faster. The slow rates of penetration of creatinine and the amino-acids into the vitreous

body is interesting and agrees with the general concept developed earlier (Davson and Duke-Elder, 1948) that the barrier separating the blood from the vitreous body is more selective than that separating it from the aqueous humour. The fact that urea, on the other hand, penetrates so readily into the vitreous is interesting: it may be suggested (at this stage purely as a conjecture) that it may, like the sugars, enter by way of the retinal and uveal capillaries, while the other substances may be restricted to the latter.

SUMMARY

The rate of penetration of certain nitrogenous substances (creatinine, urea, glycine and alanine) from the blood into the intra-ocular fluid has been studied. The rate at which they cross the blood-eye barrier is much slower than can be accounted for by a process of simple transudation or dialysis through inter-cellular spaces and suggests a transference through cell bodies.

REFERENCES

- CONWAY, E. J. (1947).—Microdiffusion analysis and volumetric error. Second edition. London, Crosby Lockwood.
 DANIELSON, I. S. (1939).—*J. Biol. Chem.*, **101**, 501.
 DAVSON, H. and DANIELLI, H. (1942).—Permeability of natural membranes. Cambridge University Press.
 ——— and DUKE-ELDER, S. (1948).—*J. Physiol.*, **107**, 141.
 DUKE-ELDER, S. and DAVSON, H. (1949).—*Brit. J. Ophthalm.*, **33**, 21.
 ——— DAVSON, H. and MAURICE, D. M. (1949).—*Brit. J. Ophthalm.*, **33**, 329.
 FOLIN, O. and WU, H. (1919).—*J. Biol. Chem.*, **38**, 81.
 ——— (1905).—*Amer. J. Physiol.*, **13**, 45.

INTERSTITIAL KERATITIS OCCURRING IN A CASE OF REITER'S DISEASE

BY

E. E. CASS

GIBRALTAR

A NUMBER of cases have already been described in the literature. All of them have the variants of diarrhoea, urethritis, polyarthritis, conjunctivitis and iritis, etc., but as far as can be discovered no case has previously been described with interstitial keratitis.

A case of Reiter's disease was admitted to the Military Hospital, Gibraltar, in 1946. He was, as is usual, a young healthy male of 24 years of age. He had had no venereal contact for 3 months and no history of previous venereal disease. His first symptom was dysuria for 12 hours and then a muco-purulent discharge from the urethra, and within 24 hours of its appearance he was in Hospital. Smears revealed pus and epithelial cells, but no organisms, and no organisms appeared on culture. There was a slight temperature only. The complement fixation test for G.C. and the Kahn and Wasserman were negative.