under the experimental conditions. As the graph shows, this concentration of ammonia was nitrified far more slowly than the hydroxylamine.

The results suggest that under suitable conditions hydroxylamine can be nitrified when added extracellularly. Preliminary results from experiments now in hand indicate that, at *p*H's lower than 8·4, hydroxylamine is nitrified a good deal more rapidly than ammonia. It therefore seems probable that hydroxylamine is an intermediate compound in the nitrification of ammonia.

HOWARD LEES

Department of Biological Chemistry,
University, Aberdeen.
Sept. 3.

[1] Kluyver, A. J., and Donker, H. J. L., *Chem. d. Zelle u. Gewebe*, **13**, 134 (1926).
[2] Martin, W. P., Buehrer, T. F., and Caster, A. B., *Proc. Soil Sci. Soc. Amer.*, **7**, 223 (1942).
[3] Lees, H., *Nature*, **162**, 702 (1948).
[4] Jensen, H. L., *Saertryk af Tidsskrift for Planteavl*, **54**, 62 (1950).
[5] Lees, H., *Nature*, **167**, 355 (1951).

Effects of Intraventricular Acetylcholine, Cholinesterase, and Related Compounds in Normal and 'Catatonic' Cats

IT has been known for some time that di-*iso*-fluorophosphonate and similar drugs, which are anti-cholinesterases in nature, in toxic doses produce syndromes resembling certain psychoses, and that in schizophrenics they aggravate signs and symptoms[1]. Conversely, it was thought that cholinesterase and other drugs counteracting acetylcholine should reduce the manifestations of schizophrenia, and they have done so, on injection into the cerebral ventricles of man[2].

Intraventricular injections of acetylcholine and of some of its antagonists were studied for their effect on the electroencephalogram of cats paralysed by erythroidine, or on the isolated cat brain. The former produces recruitment[3,4], the latter attenuates this response.

Eserine aggravates Parkinsonism in Parkinsonian man and in monkeys with lesions between the nucleus ruber and substantia nigra, whereas atropine, hyoscine and similar compounds decrease symptoms. Cannon and Rosenblueth's thesis[5] that in the peripheral nervous system the deafferented part becomes oversensitized to stimuli may obtain also for the central nervous system—as was suggested originally by Dale[6] and by Lettvin[7] in the case of Parkinsonism.

Six cats were subjected to lesions by means of a stereotaxic instrument and electrolysis at a site originally described by Ingram and Ranson[8] and later by Bailey[9]. By slightly modifying this lesion, a syndrome was produced that is indistinguishable from human catatonia; smaller lesions (two cats) permitted recovery within ten days to the extent of normal feeding and drinking and response to stimuli from man and other cats; larger lesions were not attended by any significant recovery within ten days. In the first group, intraventricular injection of acetylcholine caused a return or exaggeration of all 'catatonic' signs for two hours. In the second group, partially purified cholinesterase (with an activity of 2 *p*H units per hour per millilitre as assayed by Michel[10]), prepared for us from human erythrocytes by Dr. James Bain, produced a transient remission (1½–2 hr.) of the disability, and on repeated injections improvement was sustained and advanced.

In contradistinction to these animals with lesions, animals with none (four cats), on a single injection of acetylcholine, did not show this picture. They exhibited agitation and a behaviour which might be interpreted as hallucinatory, or they seemed to be preoccupied with their internal state, showing anger or fear in response to stimuli not perceived by observers; they also salivated profusely and defæcated within a few minutes after the injection. As the effect of the drug wore off, they resembled markedly a man who has been given a dose of pilocarpine. They became approximately normal within about one hour. Mecholyl and carbachol had a more marked and prolonged action. The doses ranged from 0·5 mgm. to 2 mgm. in the case of acetylcholine, 3·75 mgm. to 7·5 mgm. of mecholyl and 0·05 mgm. to 0·1 mgm. in the case of carbachol.

STEPHEN L. SHERWOOD*
ELLEN RIDLEY
WARREN S. MCCULLOCH

Department of Psychiatry,
University of Illinois College of Medicine,
Chicago, Illinois.
Aug. 16.

* On a research grant from the Middlesex Hospital, London.

[1] Rowntree, D. W., Nevin, S., and Wilson, A., *J. Neurol., Neurosurg. Psychiat.*, **13**, 47 (1950).
[2] Sherwood, S. L., *Brain* (in the press).
[3] Dempsey, E. W., and Morison, R. S., *Amer. J. Physiol.*, **135**, 293 (1942).
[4] Starzl, T. E., and Magoun, H. W., *J. Neurophysiol.*, **14**, 133 (1951).
[5] Cannon, W. L., and Rosenblueth, A., "Supersensitivity of Denervated Structures" (Macmillan, New York, 1949).
[6] Dale, Sir Henry, *Bull. Acad. Med.*, **13**, 379 (1937).
[7] Lettvin, J. Y. (personal communication, 1951).
[8] Ingram, W. R., and Ranson, S. W., *Arch. Neurol. Psychiat.*, **31** 987 (1934).
[9] Bailey, P., *J. Nerv. Ment. Dis.*, **107**, 336 (1948).
[10] Michel, Harry O., *J. Lab. Clin. Med.*, **34**, 1564 (1949).

Human Plasma as Antigen in the Preparation of Precipitin Serum

HUMAN serum is generally used as an antigen for the preparation of anti-human serum in precipitin tests. The use of human plasma does not seem to have had sufficient trials for this purpose. Johnson and Rawson[1] concluded that plasma of some wild animals was unsatisfactory in the preparation of precipitin serum. We have not found any reference to human plasma being used as antigen in the literature available to us.

Precipitin sera have been prepared in the Malaria Institute of India during the past thirteen years as a routine for the determination of the sources of mosquito blood meals. Since 1948, human plasma has been successfully used as an antigen. Twenty-five rabbits and twenty-nine fowls were immunized with citrated human plasma, following the conventional methods of the single- and multiple-dose techniques; ten rabbits and five fowls yielded specific anti-sera varying in titre from 1 in 1,000 to 1 in 5,000.

The significance of these is that antigen in the form of plasma is more easily and readily available from blood banks than serum obtained from volunteers and patients in hospitals.

JASWANT SINGH
S. P. RAMAKRISHNAN
SATYA PRAKASH

Malaria Institute of India,
Delhi. Aug. 30.

[1] Johnson, W. B., and Rawson, P. H., *Trans. Roy. Soc. Trop. Med. Hyg.*, **2**, 135 (1927).