heroin, methylamphetamine and other drugs is a common and an increasingly serious problem in major urban centres throughout the world. The infection is spread by needles and syringes contaminated with blood. In a report from the Centre for Disease Control, Atlanta (*Hepatitis Surveillance Report*, No. 32; 1970), males between the ages of 15 and 29 years were identified as a high risk population for abusing parenteral drugs and the incidence of hepatitis among this age group is high. Once hepatitis is introduced into a group of drug addicts who use communal intravenous equipment, the disease spreads rapidly.

Cherubin and his associates (*Amer. J. Epidemiol.*, **95**, 510 ; 1970) detected the Australia antigen, which is specifically associated with serum hepatitis, in 54 per cent of patients who were known addicts and who were admitted with viral hepatitis to two hospitals in New York. In another group of young adults with clinical hepatitis who denied the use of drugs, Australia antigen was found in 50 per cent. On the other hand, the frequency of detectable antigen among healthy volunteer blood donors in New York is only 0.1 per cent. It was suggested that the high incidence of serum hepatitis in New York City might be attributable to a greater drug addiction problem than had hitherto been considered. It is, of course, true that the problem of hepatitis among drug addicts may well have been underestimated because there is some evidence that the virus of serum hepatitis may be transmitted not only by the parenteral route but also by the oral route and by sexual intercourse.

Another disturbing report has recently been published by Collins and Wells (*Milit. Med.*, **136**, 572 ; 1971) who noted a dramatic increase in the number of patients admitted with acute viral hepatitis to Brooke General Army Hospital between July 1969 and June 1970. The greatest increase in admissions was related to hepatitis associated with illicit drug abuse.

Drug abuse may be regarded in practice as a contagious disease because the habit is transmitted from one person to another. This approach makes it possible to apply to the study of drug addiction the methods used in the epidemiology of infectious disease and notification of hepatitis in young adults may well be used as one marker of drug abuse. Knowledge of the epidemiology of viral hepatitis among drug addicts is so far incomplete, but there can be no doubt that illicit drug users constitute an important reservoir of serum hepatitis in the community and the spread of infection to close family contacts, medical and nursing personnel and indeed to the population at large presents a real hazard.

ACETYLCHOLINE

Regulation of Binding

from our Neurochemistry Correspondent

A FURTHER addition to recent rapid advances in the application of techniques of molecular biology to the study of drug-receptor interactions (see, for instance, *Nature*, **229**, 523; 1971; and **231**, 91; 1971) is provided by evidence reported by M. E. Eldefrawi and R. D. O'Brien of Cornell University (*Proc. US Nat. Acad. Sci.*, **68**, 2006; 1971) that the binding of acetylcholine (ACh) to a preparation from the *Torpedo* electric organ containing cholinergic receptors is reduced at high concentrations of ACh.

Binding was measured by equilibrium dialysis using ^{3}H-ACh, and a particulate fraction in which all the acetylcholinesterase (AChE) was inhibited irreversibly. The binding sites studied were probably acetylcholine receptors, because O'Brien and his colleagues have shown previously that the binding of muscarone (a stable cholinergic agonist) to the same preparation was reduced after treatment with a variety of drugs known to act at cholinergic receptors, but was unaffected by other drugs. In the present experiments, binding of acetylcholine was found to reach saturation at a concentration just below 1 μM, but was markedly reduced at higher concentrations.

As pointed out by Eldefrawi and O'Brien in their discussion, this "autoinhibition" of acetylcholine binding to receptors is analogous to the reduction in activity of many enzymes, including acetylcholinesterase, at high concentrations of substrate. The latter effect,

Anti-θ Antisera and T Cells

IN recent years cellular immunologists have come to rely heavily on means of identifying the cell populations involved in immune responses. It is no longer good enough to say that changes have occurred in lymphoid organs after an antigenic stimulus, though the classic approach of the histopathologist is still obviously a prerequisite in any comprehensive study. The means adopted for cell identification have been many and various and are in most instances still only suitable for experimentation with small rodents of which the genetic constitution in relation particularly to tissue strain and species specific antigenicity can more readily be controlled.

One of the most useful devices has been the use of the theta (θ) alloantigen as an indicator for (T) cells of thymic origin. A recent review by Raff (*Transplant Rev.*, **6**, 52; 1971) summarizes such work. The problems with θ, however, are numerous. It is not absolutely specific for cells of thymic origin because it has been known for some time that some brain cells are θ positive. This is usually a minor problem for the experimentalist, but more serious are the possibilities, first, that not all T cells have easily detectable amounts of θ, as has been suggested by Miller and Sprent (*Nature New Biology*, **230**, 267; 1971), and, second, that the anti-θ antisera in use are not completely specific for T cells, which is the burden of a paper by Greaves and Raff which is to be published in next Wednesday's *Nature New Biology*.

Greaves and Raff prepared two batches of anti-θ antisera by injection of CBA thymocytes into AKR mice. Both sera had the same cytotoxic titre in the presence of guinea-pig complement as adjudged by either dye exclusion or release of ^{51}Cr from labelled target cells. It was found, however, that when the first serum (anti-θ_1) was used against lymphoid target cells in the presence of rabbit complement many more cells were killed than in the presence of guinea-pig complement. The conclusion was that a supposedly specific anti-theta serum was killing B cells. It is argued that the θ_1 antiserum contained an antibody directed against a previously unknown surface alloantigen which is present on the surface of B cells. The new antibody, however, required rabbit complement for expression of its cytotoxic potential.

Greaves and Raff present further studies in which anti-θ antisera were used to inhibit splenic rosette forming cells in the presence of guinea-pig complement. Anti-θ_1 had the capacity to inhibit both background and "immune" rosettes, but if it was absorbed with (autologous) AKR thymocytes its capacity to inhibit immune rosettes in the early phase of the response was limited. The authors conclude that anti-θ_1 contains an autoantibody which can act synergistically with anti-θ. Anti-θ_2, their second batch of antiserum, was deficient in the autoantibody. A corollary is that reacting T cells are deficient in θ antigen, a conclusion in line with that of Miller and Sprent.

Thus it seems that care must be taken in the use of anti-θ antisera as absolute criteria of T cells. This may restrict the use of fluorescent anti-θ antisera on tissue sections—because of staining of non-T lymphocytes. It should not, however, be thought that the analyses of the composition of various lymphoid cell populations in terms of T and B cells by the use of anti-θ sera in the presence of guinea-pig complement are invalid. Such a conclusion would be premature and almost certainly wrong.